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ORIGINAL COMMUNICATIONS.

SYRINGOMYELIA.

BEING THE ALVARENGA PRIZE ESSAY OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA FOR THE YEAR 1895.

(Concluded from page 706.)

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In Oppenheim's case Clark's column was atrophied on the left by compression and atrophied on the right by degeneration. In the lower part of the dorsal cord the columns of Goll were degenerated. Lower down the degeneration is diffused throughout the two posterior fasciculi, and diminished from above downward to the lumbar region. The degeneration of Clark's column occupied in the same extent the right side, while the left column (the side of the lesion) had retained its normal character.

At the seat of the lower portion of the glioma the degeneration of the posterior right column was still active.[1]

The latent form of syringomyelia referred to by some authors includes those cases where no manifestations of the disease were noted during life, but where the true diagnosis was established at the autopsy. It is quite likely that if these unrecognized cases had been more closely studied during life, sensory disorders and other symptoms would have been given their proper weight. It would seem, therefore, that this class of cases would be likely to play a less conspicuous part in the classification of the various forms of the disease.

It has been claimed that in the latent form the lesion may exist in the periependymal region, and yet there be no disturbance of the functions of

[1] Archiv für Psychiatrie, 1893, vol. xxv. p. 315.

the white or gray matter of the cord. A lesion localized on one side may not necessarily be revealed in any objective symptoms referable to that locality, for, although we are not able to say just how far compensation may exist or what the channels of commissural innervation may be, it is reasonable to believe that the function of one side may be more or less completely performed by corresponding nerve-cells of the opposite side by means of commissural communications, which physiologists teach us have an existence. We are not in a position as yet to state just how these commissures act.

SYRINGOMYELIA ASSOCIATED WITH OTHER DISEASES.

Hysteria.—A few of the reported cases present hysterical symptoms. An excellent example is that reported recently by Dr. Agostini, of Perugia. The woman was thirty-five years old, and gave a family history of alcoholism, phthisis, and nervous derangements. Her present illness began four years ago with neuralgic pains in the left scapular region, and with formication and a feeling of weight and debility in the arms, first affecting the pectoral region, then the arms, forearms, and, lastly, the hands. At the same time she developed hysteria, paraplegia, and aphasia, and later on the classical convulsions of hysteria major. These symptoms persisted for two years, and were finally treated successfully by hypnotism.

Muscular force of right hand, thirty; of left, five. Marked atrophy of the muscles of the forearm, of the interossei, and of the thenar and hypothenar eminences.

Tactile sensibility is generally preserved, save on the posterior part of the left upper arm, where hyperæsthesia is present. Sensation of heat and cold and of pain are abolished from the neck to the ninth intercostal space and in the left arm. Muscular sense is intact, likewise sense of taste, sight, and hearing. Visual fields concentrically contracted. Pupils do not react. Exaggeration of the muscle and tendon reflexes. Reaction of degeneration in the muscles of the thenar and hypothenar eminences.

Agostini concludes as follows:

1. Syringomyelia may be associated with hysteria, and confusion may arise when the difference pertains to sensibility alone.

2. The presence of progressive muscular atrophy, accompanied by diminished electrical excitability, persistence of the muscular sense, point to a syringomyelic affection rather than an hysterical.

3. The best diagnostic criterion in this and other neuropathic affections is hypnosis, in which muscles with anatomical lesions do not pass into the cataleptic state.

Cases of syringomyelia and hysteria have been recorded by Charcot and Asmus.

Syphilis of the Central Nervous System.—This has been observed in connection with syringomyelia by Eisenlohr, Nonne, Jegorow, Beevor, Souques (339), Sinkler (333), Rosenblath (303).

It is liable to give rise to difficulties in diagnosis.

Lepra.—A vigorous controversy has arisen as to the relation of this disease to cases reported as syringomyelia, particularly of the type Morvan. Zambaco and others have maintained that Morvan's disease, so called, is nothing more than anæsthetic leprosy. There is no doubt that a strong analogy does exist in some cases between the symptoms of these affections and, to a less extent, scleroderma, ainhum, the tropho-neuroses, morphœa, and symmetrical gangrene. In discussing this subject before the Sociedade das Sciencias Medicas of Lisbon, Dr. Falcao expressed the opinion that Morvan's disease and syringomyelia are in reality anæsthetic leprosy, but he believes that the other affections cannot be classed with this disease. Dr. Falcao was consulted by a patient from Para who presented the following symptoms: Atrophy of the thenar and hypothenar eminences, interossei, and some muscles of the forearm, anæsthesia, bent fingers, and thickening of the ulnar nerve. Dr. Falcao made the diagnosis of lepra anæsthetica, which was justified not only by the symptoms present, but by the fact that the patient came from a country where leprosy is a common disease. Subsequently this patient went to Paris to consult Professor Charcot, from whom, it is said, he received a written statement to the effect that the disease in question was syringomyelia.

The *Gazeta Medica da Bahia* relates the celebrated case of a Frenchman named Mares, who for more than seven years appeared in the hospitals of Paris as a case of Morvan's disease. Professor Hayem and Monod confirmed this diagnosis, and the latter amputated several fingers of Mares, and published in the *Archives de Médecine et de Chirurgie* his observations of this case, which he regarded as a typical one of Morvan's disease. Later on, Broca confirmed the previous diagnosis and amputated two fingers of this patient. Again Hayem took charge of him, and amputated another finger. Several months later Mares was admitted to the Saltpêtrière, where Professor Charcot had him photographed, and for eleven months exhibited him to physicians and students as a case of Morvan's disease. Later on, Charcot diagnosed Mares's case as syringomyelia, type Morvan. Finally, this patient was admitted to the Hospital de Bicêtre, where Déjerine did not agree with Charcot as to the identity of these two affections, and stated that Mares had simply Morvan's disease. Gombault, who had made several histological examinations of the amputated fingers of Mares, admitted the diagnosis of Déjerine,—Morvan's disease. Dr. Zambaco procured the address of Mares, and, after examining him at his residence, he was convinced that he had before him a case of leprosy. In this it is reported that he was sustained by Vidal, Besnier, Tournier, Hallopeau, Quinquaud, Du Castel, and Tenneson.[1]

A genuine case of syringomyelia associated with leprosy, confirmed by

[1] See article by Dr. Alvarez, of Hawaii, Pacific Medical Journal, January, 1895. Also Semaine Médicale, 1893, pp. 289, 295.

both a bacteriological examination and an autopsy, has been recorded by Souza-Martin and L. da Camara Pestana. (See case, *Semaine Medicale*, No. 20, 1894.) The autopsy revealed in the cervical region a cavity involving the gray and white substance. The cavity was filled with a brown, diffluent mass. In preparations of this substance stained by immersion for six minutes in the carbolized fuchsine of Ziehl, then decolorized by nitric acid, he was able to find a great number of bacilli disposed in groups of the length of four μ, presenting clear spaces separated by strongly colored granulations which were found usually at the extremity of the bacillus. These characters are those of the bacillus of Hansen (lepra).

In this instance a case of syringomyelia diagnosticated two years before death has confirmed, for the first time, the ideas enunciated by Zambaco.

While it is not possible to conclude from this one case the etiologic unity of syringomyelia and leprosy, it leads us to recognize that the syringomyelic affection of the type Morvan may afford an easy entrance for the bacillus of lepra.

In leprosy with nervous disturbance the disease seems to depend on a neuritis,—*i.e.*, that tactile sensibility is involved as well as the other forms of sensibility. In very rare cases,—*e.g.*, that of Rosenbach,—we find at the seat of the macules preservation of tactile sense with alteration of temperature and pain sense.

The distinguishing features are as follows:

Syringomyelia.—Disassociation of sensory disturbances; integrity of superficial muscles of the face; absence of discolorations on the skin; hair unaffected; deviations of the spine.

Anæsthetic Leprosy.—Abolition of tactile sense; atrophy and paresis of the superficial muscles of the face; thickening and nodulous swellings of nerves; discolorations (painless) upon the body. Zones of anæsthesia and thermo-anæsthesia irregularly distributed in the shape of plaques with sharp transition from the affected to the normal areas.

These spots or islets of anæsthesia are circumscribed by a reddish line a little raised and very irregular.

In syringomyelia, on the contrary, the anæsthetic zones of thermo-anæsthesia occupy large areas limited by regular lines.

Souza-Martin goes to the extreme in denying that syringomyelia is a nosological entity, and affirms that it is merely a condition that confronts us and not a disease *per se*. He attempts to claim that it is similar in a certain sense to cavernous affections in the lungs, which he says we might just as well call syringopneumia; in other words, the condition known as syringomyelia may be present in various diseases, among which he reckons leprosy. It is needless to say that we dissent entirely from his views.

As to the relationship of lepra and syringomyelia we believe that an individual who may exhibit symptoms of syringomyelia or Morvan's disease may have, in addition, leprosy. For example, this was recently observed

by Pitres and Sabrazes in what they report as a case of systematic nervous leprosy of syringomyelic type. It required a bacteriological examination to determine its real nature. To accomplish this it was necessary in one case to excise a portion of the neuritic nerve from the living subject. The bacillus was found in large numbers, limited, however, to the nerve-fasciculus itself, none being found in the perineurium, the intrafascicular tissue, or in the vessels.

In three other cases where the bacillus was searched for and not found the conclusion was reached that leprosy and syringomyelia are distinct effections, both as to etiology and nature, notwithstanding that certain analogies are present in their symptoms. The weight of authority is in favor of the duality of the diseases, Zambaco being the principal claimant for their identity.

Syringomyelia and Chronic Hydrocephalus.—This combination points to the developmental origin of syringomyelia. Out of one hundred and thirty reported cases examined Rupferberg found fifteen in which a syringomyelia or hydromyelia accompanied a chronic idiopathic hydrocephalus. The cases of syringomyelia were those of Langhans (4), Westphal, Kiewlicz (1), Chiari (2), to which we add those of Vought and Schlesinger (Obs. 13). The latter has also recorded a case of hydrocephalus, idiocy, and syringomyelia combined. (Obs. 29.)

Spina Bifida.—This affection furnished the cases in which some of the earliest observations of syringomyelia were made. It is more distinctly related, however, to hydromyelia. (See cases of Pagenstecher.)

Tumors of the pons, cerebellum, and cerebrum have been found in cases reported by Gowers, Harris, Kronthal, Hoffmann, and Schultze.

Cervical Hypertrophic Pachymeningitis.—In Rosenblath's case this was believed to be the primary condition and the syringomyelia to have developed later. Other cases have been reported by Raymond and Critzman.

Acromegaly and Cheiromegaly.—Marie exhibited about a year ago before the Medical Society of the Hospitals of Paris a case of this character. The patient was a young man of twenty-one, having syringomyelia. His right hand and left foot had for some years been much increased in size. Charcot and Brissaud have also described a form of trophic affection of the bone under the name of cheiromegaly, which, as the name implies, is an increase in the size of the hands and fingers analogous to acromegaly. Holschevnikoff and Recklinghausen have described cases of syringomyelia with acromegaly; it is quite likely that the latter is only a trophic disturbance entirely secondary or a part of the primary syringomyelia. Hoffmann (Obs. 12) and Karg have published similar cases. (See Frederick Peterson's case.)

Amyotrophic Lateral Sclerosis.—Lloyd's case. (See Figs. 8, 9, 10, and 13.)

Friedreich's Ataxia.—This disease is probably closely related to syringomyelia. The motor symptoms, the spinal curvature, the trophic and vasomotor symptoms, to a slight extent the sensory disorders, the bulbar symp-

toms, and particularly the nystagmus, all point to the intimate relationship of the two affections. Further than this, in three out of the twelve autopsies in cases of Friedreich's ataxia collected by Griffith cavities have been found.

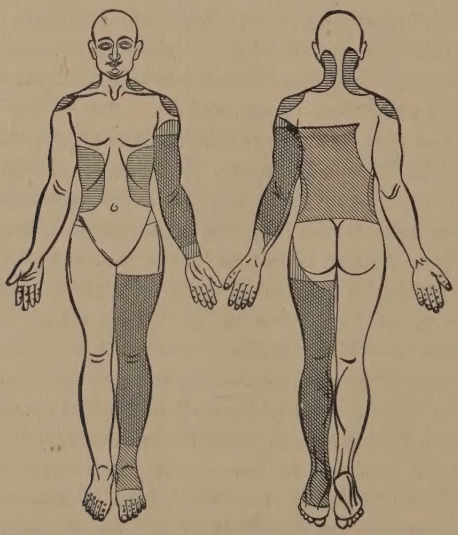
Among other diseases which have been noted in connection with syringomyelia we have Basedow's disease (Joffroy and Achard), pellagra (Pellizi), Friedreich's disease (Friedreich, Déjerine, Letulle), general paralysis and dementia (Fürstner and Zacher, Kanasugi, Hoffmann, Czerny), chronic chorea (Duchenne and Hoffmann), idiocy (Arndt), melancholia (Schuele, Meyer), mania (Defoix), and cancer of the stomach (Jeffries).

The mental state is, as a rule, undisturbed unless bulbar involvement ensues.

DIAGNOSIS.

So much has been said in the foregoing chapter on the relation of this to other diseases that a full discussion would involve much useless repeti-

FIG. 27.



SYRINGOMYELIA.—Showing analgesia (vertical lines), thermo-anæsthesia (oblique lines), tactile anæsthesia (horizontal lines). This case was associated with amyotrophic lateral sclerosis.

tion. It may be said in general that the diagnosis of syringomyelia now rests upon a firm foundation, and, in a classical case, ought to present no difficulty in forming a correct opinion during life. In fact, the diagnosis is repeatedly made *intra vitam* and corroborated at the autopsy, and that too in cases that depart in some degree from the typical form. It naturally happens that where trophic changes assume prominence, or in cases of amyotrophy or amyotrophic lateral sclerosis, or those cases in which the disease is said to be latent, difficulties will arise. But, whatever the predomi-

nating form, we must depend for our diagnosis and lay great stress on the more characteristic signs of the disease, particularly sensory troubles and the dissociation symptom. This is not, however, an infallible guide.

Clinical observations prove that the dissociation of sensibility exists in circumscribed neuritis or polyneuritis as well as in the neuritis of leprosy (Leloir, Babinski, Thibierge, Pitres and Sabrazes, Chaffard, Rosenbach, Ziehl, Nothnagel, Ferrannini), in alcoholic neuritis (Lancereaux, Lemoine), in neuritis with tabetic symptoms (Joffroy and Du Cazal and Parmentier), and in the neuritis following trauma, as in a case of Charcot's.

In this instance a gunshot wound of the neck produced an injury to the nerve-roots with the occurrence of thermo-anæsthesia.[1] Lloyd's cases of traumatic affections of the spinal cord are also cases in point.

As a rule, the dissociation symptom is observed in all reported cases, but there are a few in which this symptom is not stated to have been observed, but where other important disorders of the nervous system have existed, and at the autopsy a syringomyelia was found (Schuele, Strümpell, Schultze, Schlesinger, Obs. 6). Unless one makes a practice of examining in a careful manner the state of the various kinds of sensibility in all cases of nervous disease, it will be quite likely that cases of syringomyelia will be allowed to pass as hypochondriac, neurasthenic, or as suffering from neuritis, arthritis, etc. Cases of unusual joint-disease should always excite our suspicions, and should be tested for thermo-anæsthesia and analgesia. So also in any case of spontaneous fracture or repeated dislocation in a case of arthropathy.

On the other hand, a diagnosis of syringomyelia may be erroneously made in instances of syphilitic tumors of the spinal cord. Such a case has been recorded by Dr. Beevor, of London. A gardener, aged fifty years, after two days' exposure to wet in July, 1892, began to drag the left leg. In a few hours he had weakness of the left arm and numbness of the right knee. "He noticed the weakness of the left limbs for a fortnight before admission, as well as wasting of the left arm." On the right side the numbness spread up to the groin, and during the last fortnight to the nipple. He had no pain till a week after the onset of the symptoms, when he began to have pain in the left shoulder, elbow, and wrist, and numbness in the left thumb and radial border of the forearm. There was no affection of the sphincters, and no history of gonorrhœa or syphilis. On admission into the National Hospital for the Paralyzed and Epileptic, in September, 1892, he had wasting of both the upper limbs, especially the left, with marked wasting and loss of power in the left serratus magnus, supinator longus, muscles of the forearm, and intrinsic muscles of the left hand, as well as weakness of the left lower limb, so that he could only just raise the leg off the bed. Sensation was lost to pain, heat, and cold of the whole of the right leg and the right half of the trunk up to the fourth rib, while tactile

[1] Clinique des Maladies du Système nerveux, Paris, 1892, p. 333.

perception was normal. The knee-jerk was excessive on the left side, and left ankle-clonus was present. Later, the loss of painful sensation spread up to the right arm (ulnar border) and left forearm, involving the radial border. There was loss of electrical reactions in the intrinsic muscles of the hand. Later, he had paralysis of the sixth nerve of the right side, and he gradually became worse, and died on November 14. On examination post mortem, two syphilitic tumors were found on either side of the brachial enlargement of the cord, the left one passing nearer the cord than the right, but the cord was too soft for accurate examination.

The following statement of the similarity of symptoms and of points of divergence will be useful in distinguishing syringomyelia from atrophic paralyses:

	Progressive Muscular Atrophy.	Amyotrophic Lateral Sclerosis.	Syringomyelia.
Age	25 to 35.	25 to 35.	20 to 45.
Sex	Male.	Male.	Male.
Onset	Gradual.	Gradual.	Gradual.
Course	Progressive.	Progressive.	Progressive with remission.
Muscular atrophy	Marked.	Marked.	Marked in the arms.
Tactile sense	Intact.	Intact.	Intact.
Pain sense	Normal.	Normal.	Lost.
Temperature sense	Normal.	Normal.	Lost.
Tendon reflexes	Diminished or 0.		

COURSE AND PROGNOSIS.

The disease is essentially a chronic, afebrile one, lasting generally for a considerable length of time. Patients have been known to live forty years after the onset of the symptoms. Remissions are liable to occur in the course of the disease, and at least two patients, one of Bruhl and one of Schlesinger, have died at the age of seventy-three years. Hárcken, however, believed that he saw it take an acute course in one instance. The prognosis is unfavorable. Death may come gradually by progress of the disease, producing cachexia, emaciation, bed-sores, etc., or, particularly, by the aggravation of certain symptoms of the disease, such as trophic disturbances, panaris, phlegmon, or vesical disorders. Intercurrent affections, such as tuberculosis, etc., are common terminations.

TREATMENT.

Medical.—Pain very commonly demands relief. Owing to the chronic nature of the malady it is better to rely on preparations like antipyrin, acetanilid, or phenacetin than to begin the use of opium. Bromides and chloral will also be occasionally required. Lukewarm baths are often of considerable use. Revulsive applications of hot and cold water along the spine are sometimes useful, but care has to be taken on account of the liability to trophic disorders of the skin. On this account the cautery would be liable to give trouble. Tonics, such as iron and arsenic, phosphide of

zinc, nitrate of silver, and iodide of potassium, have all been used to palliate the condition.

Surgical.—Local treatment for panaris or ulcers on the extremities, for cracks or slowly-healing sores the result of unfelt burns, and for boils will be demanded. It is for the relief of these affections that patients commonly consult a physician or surgeon. It is important to secure the healing of obstinate cracks and fissures so as to prevent septic infection. The analgesic skin should be protected from injury. It will be necessary to avoid hard labor, and, to counteract atrophy, it will be useful to use massage and electrical stimulation.

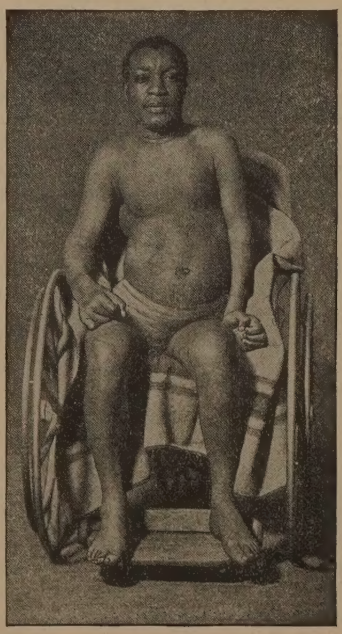
In cases where arthropathy with fluid develops, a surgeon may be needed either to aspirate the affected joint or for the removal of inconvenient osteophytes or for the closing of a persistent sinus. In an extreme case resection of the joint has been required. Surgical operations, however, are attended with more risk in these cases than in ordinary subjects.

CASES.

Case I.—Robert C., colored, aged thirty-one, born in the United States; weight one hundred and eighty pounds, height medium; previous occupation, boot-black.

Father drowned; mother, alive; three sisters died of phthisis.

Fig. 28.



He gives a history of "erysipelas" in infancy; otherwise the patient has always been healthy, but has been an extensive masturbator. He denied syphilis or gonnorrhœa. At the age of ten he was run over by a heavy wagon, his right leg being severely injured.

The present disease began when sixteen years of age. He says that his right shoulder began to fall and that this was accompanied by a feeling of excessive weakness in the left side. About six months after this he began to limp in walking as though he had stubbed his toe. A year later he noticed a feeling of weight in his left side. This gradually grew worse so that when blackening boots he had great difficulty in polishing the left side, and his brush would continually fall from his left hand. This continued for about five years. During this time he was compelled to use a cane. His right hand did not seem to be affected at this time. About four years ago he noticed a tendency to flexion of the fingers of the left hand,—a claw-like contracture,—*main-en-griffe.*

Two years later the right hand became similarly effected. He has never had any pain in his lower limbs.

Sensory disturbances began three years ago.

S. P.—The patient is a well-nourished, rather intelligent, light-colored negro. As seen in the accompanying photograph, taken at the Philadelphia Hospital, and furnished together with the following notes through the kindness of Dr. Dercum, he sits in a rolling chair during the day, since he is unable to walk or to move his arms. He has very limited motion of the fingers, particularly those of the left hand. The fingers of both hands are strongly contracted, as seen in the photograph, presenting the typical contracture of *main-en-griffe*. There is atrophy of both upper extremities, but more on the left side. The extensors of the forearm are wasted more than the flexors. The thenar and hypothenar eminences and the interossei muscles are markedly atrophied. The man is quite helpless and is unable to move from side to side when placed on his back. There is an aggravated scoliosis with convexity to the left. The tongue is protruded straight, but shows a slight atrophy to the right side with fibrillary twitching. He is unable to swallow perfectly, and has more difficulty with solid food.

Reflexes.	Right.	Left.
Plantar	Present.	
Ankle-clonus	+	0
Knee-jerk	+	0
Cremasteric	Present.	Slight.
Muscle-jerk	+	
Epigastric	0	
Abdominal	0	
Contralateral reflex of adductors	Present.	

Eye examination, January 23, 1895. Pupils normal; no paralysis of external ocular muscles; fundus normal; optic disks normal.

The sensory changes are well seen in the accompanying charts.

There is partial analgesia over the entire surface of the body, excepting in the posterior aspect of the left forearm, and in a smaller area in the right lumbar region, limited by the lumbar spine, the tenth rib, and the right iliac crest. In these regions the pain sense is normal. Analgesia is complete in the right hand and wrist, posterior aspect of the left hand and left arm and right leg, and in the anterior aspect of the left lower extremity. (See Fig. 29.)

There is total thermo-anæsthesia in the right arm and hand and right side of the posterior thorax, in the left neck and shoulder posteriorly, and over the right anterior side of the waist nearly to the middle line. It will be noticed that this area is not quite superimposed upon an area of analgesia at about the same situation. Over the anterior surface of the left forearm there is confusion of the thermic sense (represented by small circles in the figures), heat being designated cold, and cold, heat.

Case II.—Joseph Shiselbaer, aged fifty-two, German tailor.

Father died at sixty-five years of a paralytic stroke. Mother died of senility at sixty-seven. Drinks a little; syphilis denied. In the summer of 1890 lost his appetite, became costive, and felt unwell. In December, 1891, he gradually lost feeling in the right hand and arm and could not do his work. He never lost power. Later he lost power of feeling in the left hand. Sensation of pins and needles in both hands and arms, also in the legs. Arms and legs also cold. He never had severe pain. Since December, 1891, was burned many times on the hands and arms without feeling it. Is very emotional.

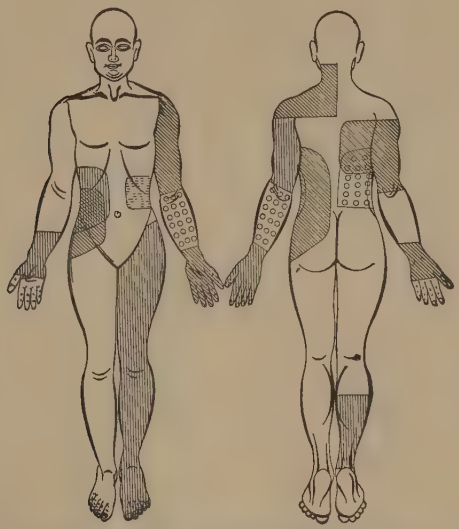
S. P.—A well-built man. No atrophy. Pain on pressure in both axillæ. No pain over the median or ulnar nerves. Spine straight; no pain on flexion of spine or on pressure. Scars from burns on index finger and thumb of the right hand. The right metacarpo-phalangeal joint of the thumb is enlarged and not painful.

Reflexes.—Elbow-jerk gone on both sides. Knee-jerk. No true clonus.

Eyes.—Pupils equal; small, react to light and accommodation. No change in form fields.

Dynamometer: Right 76; left 100.

FIG. 29.



Sensory changes in Case I., Robert Collins.—Thermo-anæsthesia, oblique lines; confusion of sensation, circles; analgesia, vertical lines.

No palsy in arms. Some trouble in touching the fingers and nose. Fibrillary twitchings of muscles of right forearm. Heat and cold sense on the right side not distinguished on the tips of the fingers, but he can distinguish at base of fingers on the palmar aspect.

The patient distinguished heat and cold well on the anterior surface of the arm, not so well on the posterior surface. Left hand same as right. At the base of the fingers feels heat only. In the anterior aspect of the fingers can recognize both heat and cold. Thermo-anæsthesia. In little finger (dorsal surface of left side) hot is called cold. Cold always felt and judged correctly, even in anæsthetic areas.

Confusion of sensation of heat and cold on palmar surfaces of both hands. Hot invariably called cold on the palmar surface of the left hand, and sometimes called warm and sometimes cold on the right side. Hot is called cold on right side over the areas of anæsthesia; not so on the left side. Can distinguish between hot and cold test-tube if time be given and the difference great. Almost always answers correctly as to cold; often does not feel heat at all, and sometimes calls heat cold, but never cold heat. Heat and cold sense normal on other parts of the body.

Tactile sense on right arm diminished on the back of the arm and radial region of the forearm, lost on the back of the hand and tips of the fingers.

On left arm can distinguish between sharp and dull points except on back of hand and first two fingers.

Tactile sense normal on the left little finger.

Sensation to pain diminished in proportion to the area of tactile anæsthesia. The position of the arm is noted well. Muscular sense normal.

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PYOTHORAX.

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History.—The treatment of pyothorax dates back to the remotest antiquity, and marks one of the most brilliant eras of pre-Hippocratic surgery. It is reported that Euryphon of Cnidos saved the life of Cinesias by opening the chest wall with the actual cautery. In the seventh book of the "History of Nature," Pliny describes the case of Pharæus, who, after having been given up by his physicians, sought death on the battle-field, but when thrust in the chest by a spearman, pus escaped from the wound, and the seeker of death recovered, having been cured by the weapon of his enemy.

There can be no doubt that thoracotomy for pyothorax was performed by the great master Hippocrates. A study of his book, "De Morbis Popularibus," will convince the most sceptical that long before this the opening of the chest wall was an established operation, the indications for which were well defined. These could be brought to such a degree of precision only as a result of the very frequent and extensive employment of different operative procedures, as free opening by the knife, the actual cautery, and the trephining and exsection of a rib. Hippocrates laid great stress upon washing the patients very frequently and with very warm water before the operation was performed. Does not this extraordinary cleanliness appear like the dawn of aseptic principles? Is it not an explanation of the operations performed at that early time with such signal success that some are inclined to doubt the authenticity of the records? In this connection, the modern surgeon may recall the frequent washings by the Hebrews,—a religio-physiological rite ordained by Moses, who doubtless was one of the greatest judges of human requirements.

The diagnosis of pyothorax, as described in Hippocrates's book, "De Morbis Popularibus," is based upon the auscultation of a "splashing sound, while the patient was shaken," and "a noise similar to the one to be heard when vinegar boils. Furthermore were considered the character of the respiration, the position of the patient, the eventual swelling of the diseased side, the fever, the pain, and the hydrops which was present now and then."

In reference to the technique of his operation, the advice is given "to prepare the patient, fifteen days after the onset of the disease, by washing him first very thoroughly with warm water. Then the patient had to be

placed upon a chair. After his hands were tightened, he was shaken by his shoulders, in order to ascertain, by the perception of the splashing sounds, which side was the diseased one. The incision had to be made far down on the most dependent part of the pleural cavity. After the skin was divided with a sword-like knife (*μαχαιρίς στηθοειδής*), surrounded by an adhesive mass up to three-quarters of an inch from its tip, a long, thin scalpel (*ἔπειτα ὀξυβελέϊ ἄπυδήσας ῥᾴκεϊ*) was thrust into the pus-cavity. As soon as a part of the pus was discharged, the wound had to be closed by a piece of raw linen, to which a strong thread was attached. The cavity had to be evacuated once every day. After the tenth day warm wine and oil were infused every morning and evening. If the pus was of a watery and sticky character and also of considerable quantity, a tube of tin was introduced and shortened gradually according to the progress of the healing process. If the left side was concerned, the prognosis was better than when it was the right one." In Article xlv. ("De Morbis," II.) the following prognostic hints are given:

"If the pus is white, clean, and slightly bloody, a cure is effected in the majority of cases. But if it be thick, greenish-yellow, and malodorous, *exitus lethalis* has to be expected."

There can be no doubt that, based upon such perfected diagnostic means, thoracotomy was performed frequently and successfully during the splendid Hippocratic era, and that the most of its admirable knowledge was lost during the twenty-three centuries that have followed.

A slight indication of what the medical world has lost of the immense knowledge of the school of Cos, and how highly educated Roman surgery must have been, can be gained by visiting the so-called "house of the surgeon" at Pompeii. The extremely large number of small wells in this house suggests, as it seems to me, at least a vague knowledge of the principles of asepsis. The streams of water constantly flowing through the streets of Roman cities were certainly adapted to remove pathogenic bacteria. By visiting these old relics of a great past, one may feel how little advanced in many respects is the present age, when compared with the medical civilization of many centuries ago. Why should not the ancient surgeon, with his fine art of diagnosis and with his powerful weapon "cleanliness," have obtained better results than the surgeon of later years, who, after washing his hands superficially in non-sterile water, went directly from an autopsy- to the operating-room! There, alas! the masterpiece of anatomical demonstration was repeated on the living patient, who was thus frequently turned into a subject for the autopsy-room.

Interesting witnesses of this grand era are the perfect instruments made of steel and bronze, which were excavated at Herculaneum and Pompeii, and which are exhibited now in the Vatican at Rome and in the Museo Borbonico at Naples.

Celsus and Galen still repeated the doctrines of Hippocrates, but later on the whole subject dropped into entire oblivion. During the Middle

Ages thoracotomy was mentioned and performed, but only sporadically, by Ambrose Paré, Fabricius ab Aquapendente, and Jerome Goulu. Heister, the greatest German surgeon of the eighteenth century, mentioned the operation as a most unsatisfatory one, and Corvisart, the celebrated surgeon of Napoleon, said that thoracotomy always accelerated death. Thus, when Sédillot had the courage to bring the operation to light again, it is not surprising that it was not greeted enthusiastically. His results, indeed, were so discouraging that the greatest surgeon of his time, Dupuytren, when himself suffering from pyothorax, declined to be operated on, uttering the classical words, that "he would rather die by the hands of God than of the doctors." Bearing in mind that the great Velpeau had lost all his cases of pyothorax, and that, of fifty cases, Dupuytren had only seen four recoveries, his conviction can be well appreciated. Most of these cases, however, be it well understood, were treated by aspiration. Later on Sédillot, seconded by Langenbeck, recommended the trephining of a rib.

But it was reserved for the great discovery, antisepsis, to elevate thoracotomy to the high pedestal which it at present occupies. Especial credit is due to the surgeons Roser, Simon, Volkmann, Lichtheim, Schede, Küster, and König; but it should not be forgotten that the great internists, Kussmaul, Bartels, and Gerhardt were the pioneers in establishing the proper indications for the operation. Much credit is due to our great countryman, Bowditch, for having first recommended exploratory punctures for diagnostic purposes, a procedure of highest practical value. It now became customary, particularly through the efforts of König, to combine the resection of a piece of a rib with thoracotomy in suitable cases. Schede, Bardeleben, Runeberg, Billroth, Rydygier, Ziemssen, Glaesser, Raczynski, and in this country, Weir, Bull, McBurney, and Lange recommended the method. It was, however, understood that resection should be performed, especially in adults and in cases of long standing, while aspiration and simple incision should be preferred in children. I may be permitted to state that as early as 1882 I advised resection of a piece of a rib in all cases of pyothorax without exception, as this method offers the best means, not only for sufficient drainage, but also for thorough palpation and inspection of the cavity. This radical step, the proposition and practice of which have brought upon me the most bitter attacks, has nevertheless been endorsed by many surgeons.

As early as 1869 the genius of Gustav Simon found a way to heal old pyothoracic cavities by resecting from three to seven long pieces of ribs, thus mobilizing the thoracic wall and enabling it to adapt itself to the contracted lung. Let me take this opportunity to give due credit to this eminent surgeon, who also performed the first nephrectomy, for his ingenious method,—an operation which, strange to say, is attributed to Estlander of Helsingfors. Simon presented cases successfully treated by him by the method described above before the Society of "Mittelrheinische Aerzte,"

at Mannheim, in 1870, but his untimely death prevented him from claiming his priority. An excellent American surgeon, Warren Stone, of New Orleans, also performed the so-called Estlander operation long before Estlander, and so did both Küster (1873) and Schede.

Lately Schede obtained the most admirable results in old pyothoracic cavities by removing the whole walls, including the ribs and pleura.

Etiology and Bacteriological Examination.—If inflammation of the pleura is influenced by a specific pyogenetic cause, pyothorax is self-originating. Unless sometimes from a traumatic cause, pleuritis is but seldom of an idiopathic character; it develops generally from a preceding disease, as croupous pneumonia, pleuro-pneumonia, gangrene of the lungs, hemorrhagic infarction, tuberculosis, pericarditis, peritonitis, nephritis, osteomyelitis, œsophageal and tracheal ulcers, spondylitis, and appendicitis. The infectious diseases, particularly measles, scarlet fever, influenza, sometimes diphtheria and small-pox, are also important causative factors. During the great grippe epidemic in 1889–90 pyothorax was extremely frequent.

Pyothorax may also be caused by the perforation of a subphrenic abscess into the pleural sac. Such subphrenic abscesses may be of stomachic, intestinal, appendicular, hepatic, cholangioitic, and of perinephritic origin. Septic infection, the various types of tonsillitic and peritonsillitic processes, and retropharyngeal abscess may also be precursors. Several times I have seen pyothorax follow grave forms of gastro-enteritis. According to Koplik ("The Bacteriology of Empyema in Children," *Archives of Pediatrics*, February, 1896) a streptococcus-pyothorax may be caused even from a slight, infected wound.

The specific causative factors of pyothorax, as well as of pleuritis, are not sufficiently known. It is still *sub judice lis* whether in these modern times the old theory of a "cold" can be seriously considered.[1]

There can be no doubt that immediately after camping on cold, moist ground, or after being wet through by rain, the symptoms of such diseases, like those of rheumatism and other acute complaints, may suddenly appear. Such facts happen so frequently that they deserve our attention.

It seems that on such occasions micro-organisms which had previously settled in temporary innocence in the organs of apparently healthy individuals are set free by some accidental irritation, such as that of a cold. While proof of such theory cannot, of course, be furnished, this much is certain: that even among the most hygienic surroundings the surface of the body is covered with pathogenic bacteria. Even the most virulent species are found in the mouths of healthy persons. From this well-proven fact we must necessarily conclude that it is not bacteria alone which produce the disease, but that, besides the germ and the favorable soil neces-

[1] There is no doubt that the rapid variations of climate so characteristic of the State of New York predispose more to pleuritis and pleuro-pneumonia than the more equable climates of other parts of the country.

sary for its further development, certain other conditions are required, the true nature of which we are still unable to determine. They may act upon the economy by reducing its vital resistance. Diathesis, or disposition, the term so often praised and so often ridiculed, is undoubtedly an important factor here, and particularly to tuberculosis.

The precursor of pleuritic effusion in the vast majority of cases is pneumonia. Why in one case pneumonia takes its well-known regular course and in another is followed by a serous effusion, which is absorbed, and why in still another case it gives rise to pyothorax, is also not explained. The existence of a so-called idiopathic pleurisy is doubted, and it is assumed that if pleuritis attacks a person who was apparently healthy before, the disease is of a tubercular character.

It would exceed the limits of this article to amplify these theories further. We may, however, learn from them that the specific causative factors of pleuritis, as well as of pyothorax, are not yet sufficiently elucidated. Whether in some cases of pyothorax the pleuritic effusion was of a serous character first and became purulent later on is not yet proved. It seems that even the so-called serous effusions, which later on "turned into pyothorax," contained the pus-producing elements from the beginning of the process, which can, of course, not be recognized macroscopically.

It was expected that the youngest branch of the medical sciences, bacteriology, would bring more light, but the most of its achievements thus far are of a problematic character; still, the investigations of eminent workers in this branch (A. Fränkel, E. Levy, Prudden, Koplik, Netter, Weichselbaum, and Prince Ludwig Ferdinand of Bavaria) have shown that the pyogenous bacterium most frequently found in pyothorax is the streptococcus. This coccus could be especially cultivated in cases of pyothorax due to trauma, caries of the ribs, pneumonia, and tuberculosis of the lungs, and also after pyæmia and septicæmia.

Many pyothorax cases, particularly the so-called metapneumonic empyemas, are caused by the pneumococcus. A considerable number show the staphylococcus albus and aureus. The pneumococcus is more prevalent in children, while the streptococcus is much more frequently found in adults. Sometimes the pneumococci and the streptococci are present at the same time, and it often happens that several varieties of bacteria are found together.

During the influenza epidemic the influenza bacillus has been frequently found in the protoplasm of the pyothoracic pus-cells by R. Pfeiffer. The typhus bacillus, the bacillus coli communis, and the micrococcus tetragenus and proteus are also found in pyothorax.

It is to be regretted that the most ingenious bacteriological investigations concern only the pus, but not the diseased tissues.

In tuberculous effusions, be they of serous or of a purulent character, the tubercle bacillus was rarely found. If there is any suspicion in this direction it is advisable to rely upon the inoculation experiment,—viz., to

inject some of the aspirated fluid into the peritoneal cavities of rabbits, mice, or preferably of guinea-pigs. Thus, the tubercle bacillus was often demonstrated by the development of tuberculosis in the animal. Two to three months will elapse, however, before such information can be obtained. When the animal is killed, tuberculous nodules from the size of a pin to that of a bean are found, particularly in the large omentum, and in other abdominal organs.

As to the significance of different pus-producing bacteria, it may be stated that the streptococcus is found in many, indeed, in at least half of all cases of pyothorax. As this coccus is most commonly found in suppurative processes, and has its domicile constantly in and on the most healthy persons, it is self-evident that it will also be present very frequently in pyothorax. It seems that this micrococcus especially tends to the formation of solid masses. Its predilection is, as we have seen, for adults, and particularly for infectious diseases.

Fränkel's pneumococcus is more prevalent in the primary pyothorax of children, about twenty-five per cent. occurring in adults and seventy-five per cent. in children. The cases in which this coccus is discovered show the most benign character of all, so that there is some inclination to attribute this to the coccus; but it seems to me that the vitality of the organs and the compliance of the thoracic walls are the main factors in the more benign character of pyothorax in children.

The staphylococcus aureus and albus, which also show a benign character, are found in pyothorax not infrequently.

In tuberculous pyothorax the tubercle bacillus is, in the majority of cases, absent. The absence of the tubercle bacillus, therefore, does not disprove the presence of tuberculosis. There are cases where the tubercle bacillus is found, and in others only streptococci, staphylococci, and several mixed forms were demonstrated. But inoculation experiments showed beyond doubt the presence of tuberculosis. In one hundred and nine cases of pyothorax Netter found the streptococcus fifty-one times; the pneumococcus, thirty-two times; the bacillus tuberculosis, twelve times; and saprogenous organisms, fifteen times. Among the latter, proteus and sarcines may be mentioned.

Of seventy-four cases of pyothorax coming under my observation within the last three years, forty-nine were examined bacteriologically. There were found: streptococci, sixteen times; pneumococci, ten times; staphylococci, four times; saprogenous micro-organisms, twice; tubercular bacilli, three times; in the remaining four cases no micro-organisms were found. In three cases, in which no micro-organisms could be cultivated, the injection into the peritoneal cavity of a guinea-pig produced tubercular infection.

As to the technique of bacteriological examination of thoracic effusions, it should be borne in mind that the skin of the patient, the hands of the surgeon, and the aspiratory apparatus, particularly the needle, must be

thoroughly aseptic. Rigorous brushing of the skin with soap and hot water, rubbing with alcohol, and afterwards washing with bichloride must always precede the aspiration, which practically must be regarded as a surgical operation.

As an additional precaution, the skin must be dislodged before introducing the needle, so that the stitch-canal in the skin and the one in the underlying tissues shall not be in line (see my manual on surgical asepsis, Philadelphia, 1895, chapter xiv., on aseptic injection). The left index-finger is pressed into the intercostal space to steady the skin, then the needle is pushed forward slowly. If a purulent effusion is represented by a very thick cheesy mass, the aspiration will most naturally be negative. The same result may be expected when the needle is thrust into thick adhesions or into a thick fibrous pleural sward, or if the calibre of the needle be blocked by a fibrinous coagulum.

Therefore, when pyothorax is suspected, the needle must be introduced several times at different portions, and when this also fails, a very large canula (a thin canula may also break in a restless patient) should be tried, to see whether thick pus could not be drawn through it. Sometimes it is preferable to push the needle far forward, pull out the piston, and then withdraw it very slowly.

After each negative result it is also advisable to put a wire through the needle, thus removing any pus which may remain adherent to the inner surface of the needle. Occasionally it will be useful, after the operation, to fill the syringe with sterile water, and force the water through the needle into a Petri dish. In case cheesy masses are present, small particles are sometimes drawn into the calibre of the needle, which cannot be seen by the unaided eye, but which, by being mixed with the sterile water, can be recognized under the microscope. In case the microscope does not give sufficient information, resort should, of course, be had to cultures of the fluid. Staphylococci are easily recognized on agar-cultures; while it is not easy to distinguish between streptococci and the pneumococcus, as the cultures on agar appear very much alike. But the difference between these two cocci can be made more marked after inoculation upon rabbits or white mice.

Bacteriological means are not sufficiently far developed to be practically utilized to any extent by the physician in general. When the benign character of the pyothorax is demonstrated by the presence of the pneumococcus, it has been advised to aspirate the pus instead of opening the chest wall. But in the section on criticisms we shall see that this recommendation must be taken *cum grano salis.*

Diagnosis.—The diagnosis of pyothorax is easy in the great majority of cases. The usual symptoms are grave, and may be summarized as follows:

History of preceding diseases, such as pneumonia, etc. (see foregoing remarks), suppurative processes in the neighborhood, pyæmia, etc. Further-

more, high and continuous fever at the beginning, later on intermittent and interrupted by cold chills, great exhaustion, headache, dry tongue. In cases of long standing, œdema of the thoracic wall is observed. Percussion reveals perfect dulness. It should be borne in mind that in pneumonia the feeling of resistance is much more pronounced, and that between the dull areas tympanitic sounds are found. Percussion also shows that the neighboring organs are always more or less displaced. Auscultation reveals absence of the respiratory sounds, or at least weakened respiration. With the new phonendoscope fine distinctions seem to be much easier than with the common stethoscope. The vocal fremitus is also either weakened or absent. In pneumonia the vocal fremitus is increased.

To these rules, however, there are many exceptions. The main differential points in regard to pneumonia have just been noted. Other sources of error occur in growths of the pleura and of the lungs (sarcoma, carcinoma, lymphoma), which also at times produce effusion. In such cases the slow course and the entire absence of fever are pathognomonic. If, in such cases, an aspiratory needle is introduced, it can be felt that the needle passes through hard masses. Microscopical examination of the cells, which are generally contained in the aspirated blood, furnishes information in nearly all such cases. Abscess of the vertebræ, echinococcus of the lungs, and actinomycosis may also raise a question.

Pyothorax is also often confounded with subphrenic abscess. Here it should be borne in mind that in subphrenic abscess there is generally a history of previous abdominal disturbance. There is no history of cough and expectoration, as in pyothorax. The heart is little if at all displaced, and there is no excessive action of the thorax or of the intercostal spaces. In the lungs, vesicular breathing is found below the clavicle, and pectoral fremitus is also clearly perceptible. There is a well-marked limit to the region of vesicular breathing, below which the expiration murmur is replaced by amphoric sounds. Deep inspiration pushes the boundary-line of the region of vesicular breathing much farther down, into areas in which formerly no respiratory murmur could be perceived. This would indicate a well-marked separation between the lungs and the abscess cavity, the boundary-line of the lungs protruding towards the abscess cavity during deep inspiration.

It is sometimes impossible to distinguish an encysted pyothorax from a subphrenic abscess. The pathognomonic signs of such accumulations, as urged by Leyden, were absence of cough and rapid change of note if the patient is rapidly turned. But, according to my observations, pleuritic effusions, particularly pyothorax, sometimes occur without showing these symptoms. (See "Pyothorax and its Treatment," *Medical Record*, May 13, 1894.) An error in this direction, however, will be of little importance practically, inasmuch as the treatment of subphrenic abscess is the same in principle as is that of pyothorax.

As before stated, to all these rules there are many exceptions. Fortu-

nately we possess an absolutely safe guard for verifying our suspicions. It is the aspiratory puncture. When properly used, this will always give the desired information. Sometimes a good deal of patience is required, inasmuch as the needle must often be introduced until fluid appears. It may happen that the pus-cavity may either be of small extent or may contain a cheesy accumulation, or may be divided by adhesions into several minor cavities. Or the needle may reach a pleural band of great thickness,—I have seen them up to the diameter of one and a half inches, and have repeatedly performed the resection of such hypertrophied pieces.

In exceptional cases one may be surprised by the result of the exploratory puncture in spite of the most minute considerations of all rules bearing upon this subject.

It may, indeed, happen that all the classical symptoms, as described above, may be absent, and still pyothorax be detected at last. I have repeatedly found pus only after many aspirations were made; as in a case where the cavity was almost filled up with a cheesy mass, the liquid pus present amounting only to a trifle. In such a case it is natural that the needle, by being introduced into these solid masses, cannot draw any pus. The same negative result can be obtained in a case where there are large fibrinous masses in serous effusions.

To illustrate the peculiarities of exceptional cases I may be permitted to direct attention to a pyothorax in a child, seven years of age, of which diphtheria was the precursor. Here the very distinct dulness began at the lower margin of the right fifth rib. The respiratory sounds were less audible above this dull area, while beyond there were entirely normal conditions. After having aspirated five times in vain on different portions of the dull area, I succeeded at last in finding a trifling amount of pus at the lower margin of the fifth rib,—that is, on the beginning of the dull area. After having resected the sixth rib and introduced a small grooved director through the costal pleura, no pus was discovered, to our great surprise (Drs. Breitenfeld, Childs, and Lowenthan being present). The diaphragm bulged forward through the incision, thus rendering further examination very difficult. By leading an aspirating needle slowly and carefully upward alongside the internal thoracic wall I reached a cavity, containing three-fourths of a pint of cheesy pus, which extended from the upper surface of the fifth rib up to the upper margin of the second. The patient recovered. There must have been by the adhesive bands means of a transmission of physical signs through the cheesy pus to the periphery below.

It has furthermore to be considered that there are exceptional cases of pyothorax where the pus-cells have settled down like a sediment to the bottom of the abscess cavity, while above a collection of a clear serous fluid is found which, if aspirated, would necessarily leave the surgeon under the conviction that no pyothorax existed at all. Such misapprehension may come all the easier if the exploratory puncture is made high up. This fact teaches also that punctures should be made below as well. It should, how-

ever, not be forgotten that it is just in the most dependent part that clots are likely to settle and to clog the exploratory needle. If in such a case absorption of the fluid should take place, and the sediment-like pus should undergo thickening at the same time, the result of the aspiration, being negative, would ordinarily give no information as to the true state of the pleural sac.

In regard to the technique of the aspiration, I also refer to the foregoing chapter on etiology and bacteriological examination. If asepsis has been thorough, no damage will result from the puncture.

Operative Treatment.—The treatment of pyothorax can only be surgical. The principles of it are governed by the same as those which are determining in any case of a large abscess,—that is, *thorough evacuation and drainage.* This can only be procured by making a wide opening in the chest wall.

This demand is so simple that it is hard to understand the still antagonistic attitude of so many to this fundamental surgical maxim. A wide opening can only be attained by combining the incision with the resection of a piece of a rib, the latter being such a simple and easy operation that any surgeon can unhesitatingly perform it.

As I practise it at present, its technique is as follows: Thorough asepsis is just as necessary as in any other operation. Particular attention must be given to the skin of the patient and to the hands of the surgeon, scrubbing with green soap first for three or four minutes, then washing with alcohol or ether, and subsequently with bichloride (1 : 500). To sterilize the skin of the patient thoroughly, it is advisable to cover the field of the operation (the hair in the axilla must first be shaved off) with a poultice of green soap. If there is enough time the poultice may remain for twenty-four hours. I regard this as an essential factor for the disinfection of the skin, because I do not believe that under ordinary circumstances the epidermis, which shelters a multitude of pathogenic bacteria, can be rendered sterile by the usual methods of disinfection, which generally are not carried out longer than from ten to fifteen minutes. A period of twenty-four hours gives the soap a chance to permeate the epidermis thoroughly, so that scrubbing on the following day is much more effective. Sometimes, indeed, the poultice macerates the epidermis so that it can be wiped off easily. Shortly before the operation the skin is scrubbed with gauze-mops dipped into alcohol, the use of which is much more important than that of any antiseptic drug, as it dissolves the fat of the skin. Bacteria as long as they are embedded in fat will not be influenced at all by the strongest antiseptic medicament.

After these precautions are taken the skin must necessarily be free from bacteria; whether, after all this, bichloride will be required is questionable.

While the patient is being anæsthetized the area of operation is surrounded with aseptic towels.

All the paraphernalia needed at the operation must, of course, be ster-

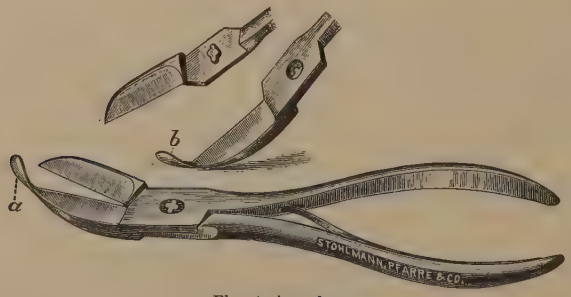
ilized: the instruments, ligatures, etc., in boiling soda solution, and the towels, sponges, etc., in steam. If no sterilizer be at hand, the towels, sponges, etc., can also be sterilized in boiling water.

As a rule, the seventh, sometimes the eighth or ninth rib is selected. If I have the choice, I prefer the median axillary line as the centre of the incision, as thence the abscess walls can be reached equally well in front and behind. It also enables the patient to be brought to the edge of the table during the operation, and permits him to assume the dorsal decubitus; whereas, if the incision were made farther back, he would be obliged to lie on the healthy side, thus rendering evacuation more difficult. If, however, the dull area, as sometimes occurs in abscesses of small extent, is far from the median axillary line, the resection must take place at the point where the aspiratory needle revealed the pus.

It would, of course, answer the simple surgical rule emphasized by Hippocrates to make the opening at the most dependent part of the cavity. But it must be borne in mind that by following this sensible maxim in this case, the error has repeatedly been committed to incise the diaphragm and even the peritoneum. In cases of short standing the diaphragm rises immediately after the evacuation of the cavity. I have even noticed that after the resection was made at the seventh rib, the opening in the thoracic wall became occluded by the uprising diaphragm.

The incision, about four inches in length, should be made directly down to the periosteum of the rib selected. Its direction must of course be parallel to the margin of the rib. An incision is then made along both borders of the rib, and the periosteum both in front and behind is raised by means of a periosteal elevator. Having freed the periosteum, the

Fig. 1.



Elevatorium shears.

elevator is pushed beneath the rib, between it and its posterior periosteum, and allowed to rest on both edges of the wound. With a blunt hook the tissues are retracted along the rib towards the axilla, and by means of a bone scissors the rib is cut between hook and elevatorium. Next, the elevatorium is pushed towards the sternum, forcing the rib from the last

fragment of adhering periosteum; the retractor is inserted into the end of the wound, and with the scissors this manœuvre is executed.

If my own elevatorium shears (Fig. 1) are used, nothing is needed but to tear away the connection between the periosteum and the rib and divide the rib, the instrument being of such a shape as to keep the tissues properly retracted. One blade, if separated, can be used as an elevatorium, so that with nothing else at hand but a knife and these shears, practically the whole operation could be performed.

Several modifications of this instrument have been made since.

Fig. 2.

Shears introduced from below upward.

Fig. 3.

Shears introduced from above downward.

Dr. Henry Koplik found it advisable to construct a rib-shears after the model of my elevatorium-shears for the use of the left hand also, the essential part of this instrument being that the flat side is left out. It is certainly convenient sometimes to have two shears, but it is not necessary, as my instrument can be introduced from below upward (Fig. 2) as well as from above downward (Fig. 3), thus making it available for both hands.

A piece three inches in length in children and three and a half to four inches in adults is resected. In very large cavities, as especially found in cases of old standing, two or three ribs are resected.

During these manipulations it is impossible to strike the intercostal artery on account of its anatomical situation, while in performing simple incision this accident has frequently occurred.

A saturated solution of iodoform in ether is then spread upon the wound surface to form a protection against the escaping pus, aseptic tampons may also be pressed against the wound surface for the same purpose.

The very thin thoracic fascia and the costal pleura are now incised, the opening being just wide enough to permit the introduction of a grooved director. As soon as pus appears in the groove of the director a small Péan forceps is introduced, and the opening is gently dilated. Evacuation of the pus must take place slowly, as rapid evacuation might produce fatal anæmia of the brain, on account of congestion of the lungs. The time for evacuation may be from twenty to thirty minutes. A sponge should be pressed against the opening from time to time to interrupt the stream, thus avoiding too rapid expansion of the lungs. The pulse, the respiration, and the color of the face should be watched very thoroughly during these manipulations.

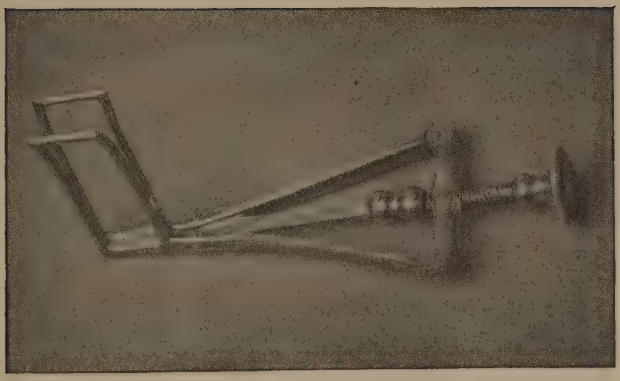
If the condition of the patient permit, the finger is now introduced, and any solid masses, such as fibrinous lumps or necrosed tissues adhering to the abscess wall, are wiped with the index-finger or with sponges fastened to a sponge-holder, or even with a blunt spoon, which I advise for that purpose. By now introducing the pleural speculum (Figs. 4 and 5) advised by me, the whole cavity can be inspected. Further cleaning is then an easy matter. The solid masses are best brought out by an irrigation with a sterile normal salt solution. When malodorous pus is found, an antiseptic wash, preferably bichloride of mercury (1 : 5000), is used for this instead.

If hemorrhage should have occurred, or if signs of shock are present, such procedures may be deferred for a day or two.

The costal pleura is now stitched to the skin with four silk sutures (on suppurating wounds I used to prefer iodoform-silk sutures), one at each end of the wound and one on each side, with strong Hagedorn needles, for ordinary needles break easily when handled here. Thus the wound surface is entirely covered, and the adjacent tissues are protected against infection. At the same time secondary hemorrhage is thereby prevented and the wound kept open. (This procedure I used to term "pleurostomy.")

If more than one rib is to be resected, the periosteum of the rib below is divided and the rib resected in the same manner as the first one. (Fig. 6.) The costal pleura underneath is also incised, a large aneurism-needle is afterwards introduced through one of the pleural incisions, and conducted underneath the costal pleura to the other. With strong silk sutures the tissues, containing fascia, muscles, periosteum, costal pleura, and intercostal arteries,

FIG. 4.



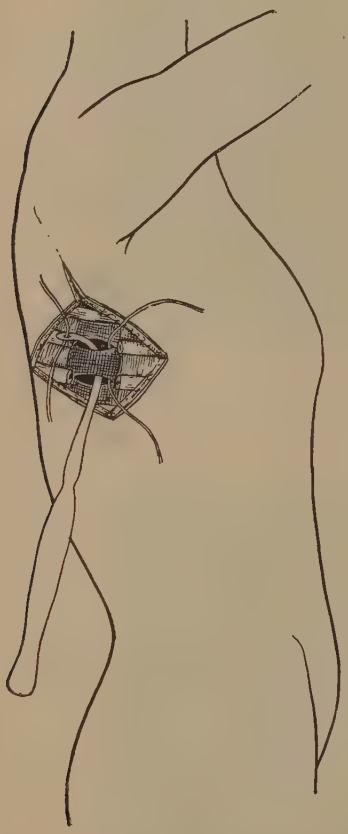
Pleural speculum.

FIG. 5.

Pleural speculum *in situ*.

are ligated close to the cut surface of the rib. Then a vertical incision is made through the tissues between the two ligatures, thus creating a wide opening. If the skin is forcibly retracted, the skin-incision can be utilized for the resection of the rib above. The whole side is then protected with a large piece of moss-board, which, after being slightly dipped in water, adapts itself to the contour of the body like a plaster-of-Paris dressing. The dressing should, however, be applied while the patient assumes the dorsal decubitus, as sudden anæmia of the brain might be caused by the erect position.

Fig. 6.



Needle *in situ*.

The whole pus-cavity is packed with iodoform gauze, a narrow strip, several yards long, being preferable for that purpose. The packing is done tightly for the first day in order to prevent hemorrhage, later on loosely.

It is only after such rigorous procedures as I have described that the cavity can be pronounced entirely evacuated. No necessity for subsequent irrigation arises, as all obnoxious elements were removed.

Full anæsthesia should be administered only if the pulse is strong. This is an exceptional circumstance in all cases of abscesses that have existed for a long time. It is well known to what immense dangers a general anæsthetic exposes the thoracic organs when their functions are so much impaired by compression. Ether being contraindicated in every respiratory disturbance, only chloroform could be employed; and I need not call attention to the danger to which the use of this paralyzing drug subjects the heart. Since the operation takes but a few minutes for a well-trained surgeon, it would be better to use an ether spray when an anæsthetic is required. Even cocaine has its dangers. If chloroform is employed, only a few drops should be poured into the mask at a time, and the pulse, the respiration, and the color of the face should be very carefully watched. A hypodermic syringe for the use of stimulants (strophanthus, camphorated oil), tongue-forceps, and mouth-opener must be close at hand.

After-Treatment.—The packing with iodoform gauze renders after-treatment very simple. It has the great advantage that no subsequent

irrigations are required. This is an important factor regarding not only the irritation resulting, which has repeatedly caused sudden death, but also because it prevents the formation of those very adhesions which are so much needed for the obliteration of the cavity. How important these adhesions are for the agglutination of the pleuræ was emphasized as early as 1865 by Dr. A. H. Smith, of New York City.

No frequent change of the position of the patient is required, as is the case under treatment with drainage-tubes, the use of which I had always regarded as a great evil in former years, when I was too timid to try the more radical methods of my present practice. All the pus is absorbed by the iodoform gauze in the cavity, this preventing its stagnation. Consequently there can be no decomposition, and, therefore, no fever.

The first dressing must be renewed after twenty-four hours, as, during the first few days, the discharge is generally quite abundant. Then the dressing, except in the presence of malodorous pus, need not be changed more frequently than every second or third day. The patient, if at all able, should get up after one week. During the first few days of the after-treatment small doses of morphine are administered for the purpose of immobilization, especially when cough is present. If the pulse be weak, strophanthus and caffeine may be added. Nourishment is given frequently and in small quantities to avoid distention of the stomach.

If the pyothorax be of short standing the cavity may become obliterated in two or three weeks. In one of my cases, that of a child six months of age, obliteration was perfect six days after the resection, but this, of course, was a very exceptional occurrence. In older cases it may take months. The average time for cases of short standing is four weeks. Thoracic fistula remained in none of my cases treated in the manner described. The dressing acts like an aspiratory valve, which yields to the internal expiratory pressure, the latter often being intensified by cough, etc., while, at the same time, it resists the inspiratory external pressure. In cases of short duration it is astonishing that as soon as at the change of the first dressing the lungs are found well distended again, the percussion is normal, and auscultation reveals vesicular breathing above the formerly dull area.

Such occurrences show that the atmospheric pressure, which is erroneously regarded as hindering the early inflation of the lungs, can be of but little importance in this connection.

The healing process does not take place by granulation, but by the distention of the lungs. Where the pulmonic pleura turns in the costal, where, in other words, the lungs touch the thoracic walls, a portion of the distending lung tissue adapts itself to the costal pleura, where it becomes agglutinated by fibrinous adhesions.

Prognosis.—If we exclude septic and tuberculous cases, the prognosis of pyothorax rests entirely upon the early diagnosis. In other words, the family physician is responsible before any other individual for the final outcome.

Among the large series of my cases of this type I do not recollect a single one, in fact, which did not recover. The operation itself is entirely void of danger if done under the precautions described above. The gratifying results obtained in my cases I can only attribute to the thorough evacuation made, and particularly to the removal of the solid masses found in the great majority of cases. In seventy per cent. of my own cases I found them present to a greater or lesser extent. No method except resection enables the surgeon to introduce his finger, which procedure renders examination of the cavity possible and permits of thorough evacuation at the same time.

So far there is no method which shows with any possible degree of probability *before operation* whether such fibrinous or cheesy masses are present. All we know is that the streptococcus has a predilection for the inhabitation of solid masses. Yet recently, in my own cases, the streptococcus has been found several times where no solid masses were present. A large opening, which can be insured only by the performance of a resection, allows inspection and palpation of the cavity and represents the only means to diagnose the presence of the solid masses. So long as we can get no information about this most important point by other methods, resection should always be preferred for this reason alone.

If performed late in an emaciated patient whose strength has gone under expectant treatment, resection will often not avert the fatal result, the lungs having lost their contractilily after so long a period of compression, while the functions of the neighboring organs are impaired by the long duration of their displacement.

There are, in fact, no contraindications for the radical operation. Even in the exceptional and inexcusable cases of long standing, where the patient may be cyanotic and very weak, with a small and frequent pulse, a preliminary aspiration may be done to relieve the patient, and resection should be performed on the following day.

In 1882 I advised resection of a piece of a rib in all cases, no matter how desperate they appeared, and I have found no occasion since to deviate from this principle. I have seen cures even in cases to the operation of which I had proceeded without a gleam of hope, this showing how easily we may err in our prognosis. Even in such desperate cases where the tarrying policy had caused amyloid degeneration of the liver, ascites, etc., entire restoration to health has sometimes followed resection treatment. Amyloid degeneration on this basis must not be regarded a hopeless condition, especially in children.

In tuberculous cases repeated cures have been effected, and my statements about the advisability of the resection treatment in such cases have been corroborated by Schede and Güterbock, and later by Küster, Rydygier, Hofmokl, Th. Weber, and Koranyi, who all reported a not inconsiderable number of cures. Regarding the absolute hopelessness of this type of the disease if left alone or treated medically, even a much smaller

percentage of cures, as reported, would urgently indicate the resection treatment. It would also be of incalculable benefit if such patients were operated upon much earlier. The chances being then much more favorable, the number of cures would be considerably augmented.

While primary miliary tuberculosis as well as pyothorax, caused by the perforation of a tubercular cavern into the pleura, gives a very poor prognosis, those cases in which the pleura has been infected from tubercular lungs show a considerable percentage of cures. Mixed infection is generally present in cases of this variety, the pneumococcus, staphylococcus, and streptococcus being also found.

As discussed in the section on etiology and bacteriological examination, the tubercle bacillus was not found in the pyothoracic effusion of a considerable number of these cases, in which, nevertheless, the presence of tuberculosis could be well proven by other than bacteriological means of investigation. In other words, the absence of the tubercle bacillus does not at all prove the absence of tubercular disease. As long as our diagnostic means in this direction are not more reliable, the surgeon will always be on the safe side by operating upon every pus-accumulation in the pleural sac, whether tubercular or not.

Whether exposure to the atmosphere is a healing factor in this connection, like the opening of the peritoneal cavity, can only be conjectured.

Those of my cases in which malodorous pus was found at the time of the operation invariably died. In all of them other grave processes were present,—either tuberculosis or multiple pyæmic foci. Some of these cases I have observed after grave gastro-enteritis in children. In some of them tuberculosis pulmonum was present, and perforation of a cavity into the pleural sac was suspected. In such cases we see an attempt of the *vis medicatrix naturæ*, which was defeated by the virulent infection.

If infectious diseases are the precursors the prognosis is much more favorable, particularly so after measles and influenza. The same view applies to trauma. Somewhat less favorable is the prognosis after the perforation of a subphrenic abscess.

As already stated in the section on etiology and bacteriological examination, those cases of pyothorax in which the pneumococcus is found show the most benign character of all. They are the most prevalent in children. Whether this is due to the particular character of the coccus itself is doubtful. It seems, as alluded to before, that the vitality of the organs and the pliancy of the thoracic walls in childhood are the main factors of this more benign tendency.

Accidents.—There are many reports on accidents which have occurred during anæsthesia. But if the principles emphasized in the section on operative treatment are obeyed, accidents from anæsthesia can hardly occur during the operation itself. I have, however, not infrequently heard of suddenly fatal cases in which the anæsthesia was left to beginners, who, in their ignorance, gave the anæsthetic too freely. While it is certainly most

agreeable for the surgeon not to be disturbed by the insufficient anæsthesia of the patient, it is wrong to subject the patient to any greater risk of life than is absolutely necessary. I know of several cases in this city where the patient died under the anæsthetic before the surgeon in charge had an opportunity to perform an operation on the chest wall. What the legal aspect of such occurrences is every surgeon knows.

Still it is surprising that such accidents do not occur more frequently in patients who suffer from large effusions which compress one lung totally and the other at least partially, and where, furthermore, the heart is displaced and the circulation in the large blood-vessels impaired. It is less cruel to trouble the patient and to save his life than to give him the so-called benefit of a full anæsthesia and to risk his life under the pretext of humanity. A limited anæsthesia frequently leaves an impression only, and not a clear perception of all the surgical procedures; and frequently it is the nervous dread of these procedures, and not the physical pain itself, which terrifies the most courageous patient. The odor alone of an anæsthetic will sometimes give the patient the agreeable impression of being insensible to pain.

Nor is irrigation by any means void of danger, even if sterile water only be employed. It is, therefore, a decided advantage of the resection-treatment that this does not require this dangerous and annoying manipulation. Dangerous conditions are especially provoked if the irrigating fluid be driven into a bronchus, when a communication exists. Violent cough paroxysms of long duration are generally observed under such circumstances, the patient sometimes succumbing during such a paroxysm.

Sudden collapse has repeatedly followed a too rapid and too forcible infusion, or a too rapid evacuation of the irrigation fluid. (Compare section on operative treatment.)

Rubber drainage-tubes have always been a great source of trouble to me. The mode of resection-treatment that I advise dispenses altogether with this *crux medicorum*.

During a period of fifteen years I have been called seven times to extract drainage-tubes which were imperfectly secured (as by one safety-pin only), or where the rubber was of an inferior quality, so that breakage occurred. Twice I have removed drainage-tubes, one being nine and the other eleven inches long, more than one year after operations by Buelau's method. There existed a strong predilection among physicians for very long drainage-tubes, on the assumption that the longer they are the better they drain the cavity. This is an error. Long tubes are nothing less than an obstacle to the expansion of the lungs, and do not drain off any more than short ones which reach only the internal opening of the cavity.

In stitching the costal pleura to the skin a strong needle should be used, preferably a Hagedorn needle. It has occurred that in stitching the pleura to the skin the needle has broken and dropped into the pleural cavity, wherefrom it could be extracted only with great difficulty and danger.

Criticisms of the Different Methods.—The methods considered nowadays in the treatment of pyothorax are simple aspiration, permanent aspiration (Buelau's method), incision, and resection.

A discussion of the value of the so-called "expectant treatment" will hardly be expected in a surgical article. Still there is no doubt that the *vis medicatrix naturæ* is frequently triumphant where either diagnostic ignorance or obstinate aversion to surgical procedures dictates therapeutic nihilism. There are cases of pyothorax which heal by perforation into a bronchus or by absorption, the latter process especially having been observed when the pneumococcus was found. As such occurrences are extremely rare in comparison with the enormously large number of the victims of delay, and as we do not at all know the conditions under which such exceptional cures are effected, such hazardous expectations may well be called even criminal. It is true that cases sometimes recover not because of but in spite of the treatment. But can a rule be deduced therefrom? And does not the exception confirm the rule? Furthermore, if really such absorption takes place, the question is raised whether this be really a fortunate event for the patient, as clinical experience shows that whenever absorption of pus takes place during a considerable length of time, a disposition to tuberculosis may be induced.

A perforation into a bronchus might just as well cause suffocation. Another mode of the *vis medicatrix naturæ* deserves mentioning,—namely, the so-called *empyema necessitatis*,—that is, a pus-collection in the pleural cavity which perforates through the chest wall. But of this it may be said, that it would, as a rule, represent nothing but an attempt of nature to heal, and, as a rule, not a successful one inasmuch as drainage is entirely insufficient. Consequently most patients in whom this "fortunate accident" happens succumb later to the consequences of pus-retention, unless a free opening be finally made.

R. K. Pel (*Zeitschrift für klinische Medicin*, p. 211, Berlin, 1890) says that the principle *ubi pus, ibi evacua* has justifiable exceptions, and that if empyemata be of small size, if the general condition of the patient be excellent, the pulse slow and full, fever absent, and the appetite good, absorption through thickening can be expected. But in such cases the correctness of the diagnosis seems to me to be more than doubtful, as no exploratory punctures were tried.

If such nihilism is based upon an exclusive consideration of pathology, it deserves more attention than if it be simply the outcome of ignorance. Nevertheless it does the patient the same amount of harm. Medicine is not only a science, but first of all it should be a practical art, of which pathology is certainly the basis, but still only a part of the entity. Only when the two factors, science and art, go hand in hand, does the patient obtain that amount of benefit to which he is entitled.

Simple aspiration is done by a trocar, to which such attachments are made that no air can enter the pleural cavity while the instrument is *in situ*.

Many different kinds of apparatus are thus contrived, some of them, like that of Dieulafoy, being very complicated and expensive. Whether the entering of the air into the pleural cavity, however, is really such a dangerous occurrence as is generally supposed, is not sufficiently proven. It seems to me that most of the accidents following simple aspiration are due to non-observance of aseptic precautions, to which careless operators are so much inclined.

As to the therapeutic value of simple aspiration in pyothorax, I can myself testify to the fact that perfect cures have been effected by this method, particularly in children, in whom the benign pneumococcus is so frequent. (Compare section on etiology and bacteriological examination.) Such cures are repeatedly reported. But these few cures are nothing in comparison to the immense number of those who have died under the aspiration-treatment. I will refer only to Dupuytren's experience in aspiration (see section on history). Of the large number of my own uncomplicated cases which submitted to early resection, I have lost not a single one, but it has frequently occurred to me that in the cases which were repeatedly aspirated, but unsuccessfully, and in which as a last resort resection was practised, the procedure was too late.

As before stated, in seventy per cent. of my cases solid masses were found in the pus-cavity. These could certainly not be aspirated. Now, if any of our diagnostic means could enable us to know whether such masses were or were not present, it might appear more justifiable to recommend free opening only in cases where solid masses are present and to try aspiration when they were absent. But as long as we possess neither physical, mechanical, nor speculative means to make this differentiation otherwise than by making a free opening, we have to choose the method which guarantees removal of the solid masses; and if a case which would have recovered by simple aspiration should undergo the more radical procedure of free opening, it will certainly not succumb, but will get well just the same.

Albert very well says, in reference to aspiration, "This procedure is analogous to the pumping out of other abscesses, as, for instance, suppurating buboes. In such cases a variety of aspiratory instruments have been tried, and once in a while a cure was effected. The only courageous and clear treatment is the broad opening."

This half-hearted surgery is analogous to the well-known surgery of emancipated midwives. Aspiration is evidently a very easy procedure; it is, in fact, "no operation," and the most unskilful surgeon can do it. So it finds its most enthusiastic advocates among the large contingent of the would-be operators who are so self-confident that they "never require the advice of a surgeon." They are generally the same who see all their cases of appendicitis recover without being "fooled by the surgeon." When they aspirate, they draw as much pus as they can; the patient is then greatly relieved, and so enthusiastic in praising this most agreeable way of

being operated upon that it would be simply impossible for a surgeon to persuade him to such a "mutilating operation" as free opening. If the pus accumulates again, the patient gladly submits to a second and also to a third or fourth aspiration, because "a stab with a needle is no operation." But the solid masses in the pleural cavity cannot be driven through the calibre of the aspirating needle, nor will they be absorbed. So the aspiration is repeated until much precious time is wasted, the patient becoming emaciated and the lungs contracted. Then, as a last resort, a free opening is made, which at this late stage is often not able to prevent the *exitus lethalis*. From such occurrences the aspiratory enthusiast deduces of course that free opening, particularly the resection-treatment, yields a bad prognosis, and that he, at least, "never saw a good result from it," which I certainly believe. I trust, however, that all these surgical imitators would give up aspiration could they once see the solid masses in the pleural cavity. But unfortunately they never see an opened thoracic cavity, at least not at the early stage of pyothorax, and so they naturally conclude that such masses do not exist.

Aspiration, however, is by no means always an innocent manipulation nor void of danger. The irritation in the pleural cavity may produce epileptic spells, vertigo, nausea, fainting, and even fatal collapse. At the same time a nervous surgeon may interfere with the intercostal artery. According to reports, death has repeatedly occurred through extensive hemorrhage from this source.

It may be emphasized, in conclusion, that aspiration should be reserved exclusively for exploratory purposes, for the cure of so-called serous effusions, and for temporary relief in exceptional cases, as described in the section on operative treatment. In the latter variety, however, where patients are extremely exhausted, resort should preferably be taken to aspiration combined with drainage (Buelau's method).

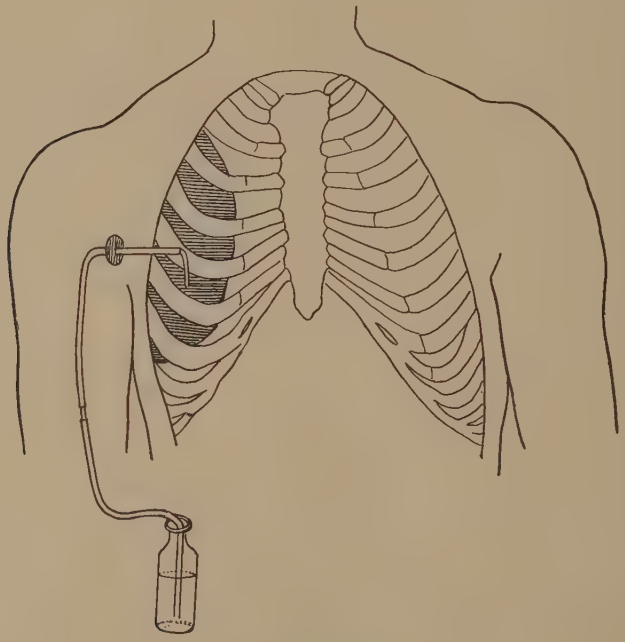
As to the definition of serous effusion, I may say that I call those effusions serous which, although they may contain a small amount of pus-cocci, still show the light color and the characteristic consistency; while pus represents a yellow, thick, homogeneous fluid. In practice the differentiation should only be made macroscopically.

In 1879 Baelz advised the combination of aspiration with irrigation. The wish was father of the thought, and it was certainly a splendid idea to try to wash out the solid particles from the pleural cavity. But these masses are unfortunately of too large size to be forced through the canula of a trocar, so that this method, which was received with great enthusiasm, dropped into deserved disuse.

Permanent Drainage.—The so-called Buelau's or suction method (Fig. 7) deserves attention. It is far superior to simple aspiration in that it aims to prevent refilling of the pus after aspiration. The technique of this method consists in introducing through the intercostal space a large trocar, from which the stylet is withdrawn and only the canula remains.

After a rubber drainage-tube is pushed forward through the canula into the pleural sac the canula is removed. The tube, which must remain *in situ*, is then fastened to the skin with adhesive plaster and connected by a glass canula with a long rubber tube. The rubber tube ends in a glass vessel filled with bichloride of mercury, where it is kept by attaching a piece of lead to its end. The glass vessel may be represented by a bottle,

FIG. 7.



Suction drainage.

which the patient can carry around in his waist-pocket. The advocates of this method claim that a permanent evacuation proportional to the expansion of the lungs is thus achieved.

Brilliant, however, as this method appears on a superficial contemplation, it has many and great disadvantages. First of all, the same objection as against simple aspiration must be raised,—namely, that the solid masses cannot be removed by suction any better than by simple aspiration. Even the advocates of this method admit that the drain is oftentimes obstructed by fibrinous coagula. Fever is nearly always present, on account of retention of pus. It is but a small consolation that, by the introduction of instruments and frequent irrigations, this perpetual obstruction can be removed, and that in the course of time the solid masses become liquefied.

Another very disagreeable feature of this method is that the drainage-tube comes loose in the wound canal, which will finally suppurate, and then, of course, the seclusion from the air is no longer hermetic. Even

as strong an advocate of this method as Aust. (*Münchener medicinische Wochenschrift*, 1892, No. 45) complains that pus which was free of odor at the time of the operation repeatedly became septic in the later course of the treatment. When the adhesive plaster becomes loose the drainage-tube is apt to drop into the cavity, and the only way to remove it thence is by free opening. I have seen four cases in which such accidents happened after Buelau's method was used; but, as they necessitated resection, I am not sure, after all, whether the accident was not fortunate for the patient.

It is furthermore to be remembered that all such patients require much more careful watching than those under radical treatment. In fact, the control must be so close that it can be well carried out only in a hospital, and therefore the method is not very practicable in private practice.

In cases where the intercostal space is narrower than usual, a small drainage-tube can sometimes be introduced only with difficulty and after much annoyance to the patient; so, as already stated, Buelau's method should be reserved for very emaciated patients, and then used only as a temporary resort. It is significant that the advocates of this method are all internists.

Simple incision through the intercostal space has still many advocates who claim that a small incision which permits of the introduction of a small-sized drainage-tube fully answers the purpose of evacuation and of drainage. It is also claimed that any general practitioner could make the incision; while resection is regarded as a difficult operation, which would require the well-trained hands of a surgical specialist. Resection should be reserved, therefore, as a last resort only in cases where, after several months of unsuccessful treatment after the incision method, the ribs have approached each other to such a degree as to render the drainage imaginary.

As regards the advice to make a small opening into an abscess, I may say that, according to commonly accepted principles, it is not expected that a small opening in an abscess will secure thorough drainage and evacuation. Modern surgery prescribes that the opening should be made as broad as possible. It is intended to expose the abscess cavity so much, indeed, that not only can it be inspected thoroughly in its whole extent, but that its walls can also be palpated, and that its lining membrane as well as necrotic tissue (the latter often being present in abscess cavities) can be removed. It is only after such rigorous procedures that the modern surgeon is satisfied that the evacuation is thorough. The wound discharge will be scant and will be found in the gauze introduced into the cavity. No retention is expected, and, as a natural sequence, a perfect and quick recovery is to be looked for. It would not, nowadays, be expected that a surgeon should "lance" an abscess anywhere else, or introduce a small drainage-tube, the use of which would also imply the necessity of daily irrigations. But why should a pyothoracic cavity be treated on different principles from other abscesses?

After simple incision the field of operation cannot be inspected at all. Only if the intercostal space is very wide, which is never the case in children and seldom in adults, the surgeon's finger can be introduced; and if the opening permits of this, the finger is greatly restricted in its exploratory motions, and only small solid masses can be removed. Large masses will remain. Adherent clots cannot be detached from the pleura, nor can very large masses of them be reduced inside of the cavity, thereby making it possible to wash them out by a subsequent irrigation. So these masses have to undergo decomposition, and are dissolved or liquefied under constant febrile elevations, retention of pus of course always being present, when, at last, they may be washed out, provided the patient holds out so long.

As regards the alleged difficulty of resection, I am confident that the physician performs many a more difficult operation than that of rib-resection. If he desires earnestly to learn its technique, operating once on a lower animal will enable him to do it properly. Interference with the intercostal artery happens much more frequently in simple incision than in resection on account of the situation of the artery below the inner surface of the rib. In resection the incision is made only as far as the periosteum. So far there are no vessels of any importance. Then the further procedures can be carried out with blunt instruments. The tissues in which the artery is embedded are pushed aside so that it can be easily seen and avoided. If such an accident occurs after incision resection has to be made at once, but if the operator is very nervous the patient may bleed to death before it is completed. But if such an accident should really happen after the resection of the rib, which can hardly be imagined as possible, the artery can be caught without any trouble. Fatal hemorrhage from the intercostal artery after incision is reported from several clinics (Billroth).

If, as before suggested, the ribs move together after simple incision, further introduction, even of a small drainage-tube, becomes impossible. This condition prevails in the majority of cases. In fact, it represents a type of the almighty *vis medicatrix naturæ*, the effort of nature to diminish the extent of the cavity. But, unfortunately, the intended remedy in this case is nothing but a prevention of the cure, because it obstructs the opening.

As mentioned before, I have during the last two years dispensed with the drainage-tube entirely. Formerly I used to introduce a rubber drainage-tube of the size of a man's index-finger three days after resection. The tube was secured by two large safety-pins adjusted through the wall of the tube in the shape of a cross. The reason why I advised not to introduce the drain immediately after operation was that I had not only witnessed considerable hemorrhage after it, but also observed considerable irritation by friction, this being caused by the constant respiratory movements of the pleuræ. It seemed to me that as soon as granulations appeared, the pleuræ also becoming accustomed to contact with the atmosphere, the irritation

was well borne. Two weeks after operation, on an average, a smaller drain was introduced and gradually shortened. When the discharges became scanty the drainage-tube was left out and a small strip of iodoform gauze was substituted. For the following few days the patient was watched very carefully. It happened frequently that the cavity was entirely obliterated on the following day, but often union was only superficial, and retention of pus occurred, always indicated by an elevation of temperature. Then, of course, the drainage-tube had to be reintroduced, and after a week the same manœuvre was repeated until, several days after the obliteration, no discharge showed and the temperature had remained normal. Sometimes the presence of pus was revealed after a grooved director was forced through the scar tissue. The position of the patient had also to be changed every few hours, so as to make the pus flow into the dressing, thus trying to avaid stagnation of pus. The great danger of stagnation induced Küster to recommend counter openings on the opposite side of the original opening. All these annoying manipulations are rendered unnecessary if the cavity is packed with gauze.

The disadvantages of the drainage-tube in general are, in the first place, that no antiseptic influence will be exercised upon the wound or the cavity itself; but when, in a wound, the antiseptic gauze covers the outer ends of the tubes, it prevents decomposition of the wound products only after they have left the tubes and have entered the gauze, so that the absorbent qualities of the gauze, which are of such great value, are not utilized. If a cavity be packed thoroughly with gauze every particle of discharge must be absorbed, and, however large the cavity, *the pus will be in the gauze only* and the wound surface cannot be otherwise than dry. At the same time the antiseptic, with which the gauze is impregnated, exerts its permanent influence directly.

A drainage-tube does not withdraw or absorb pus, for it has no power to aspirate the pus, which merely traverses the tube, its lumen being the point of least resistance. But the flow through the tube occurs only *when pus is abundant,* which is the first step to its retention.

In conclusion, I feel justified in claiming that the resection method in connection with subsequent gauze treatment is, in contradistinction from all the other methods described, a clean, easy, safe, and nearly bloodless operation. It guarantees a large opening for a sufficient length of time, and makes subsequent operations unnecessary. Thoracic fistula in particular is impossible if the method be carried out at the proper time. The resected piece, if the periosteum has been preserved, is always restored, as can be demonstrated by palpation as well as by the Röntgen rays.

Statistics.—My own statistics embrace two hundred and thirty-one cases, observed during a period of fifteen years in the city of New York. After deducting the twenty-four cases published more than ten years ago (*Neu Yorker medicinische Presse,* December, 1886), two hundred and six remain in this series. Among them were sixty-eight below three years;

sixty-one were between three and five years; thirty-seven were between five and ten years; nineteen were between ten and sixteen years, and twenty-nine above this age. Among them nineteen died. Ten of them were children below five years; of the others, two were between five and sixteen years, and seven above that age.

Among the non-complicated cases, where inflammatory processes in the lungs or pleuræ had been the precursors, one hundred and ten were diagnosed at an early stage. All these cases recovered. In fifty-six cases the operation was done at a late stage, nine of them showing the typical vaulting of the thorax. In five a fistula remained. Three of these cases ended fatally from amyloid degeneration. In one of these cases the fatal end occurred sixteen months, in the second case twenty-one months, and in the third case three years after the operation; in all of them Simon's (the so-called Estlander's) operation had been tried. In the latter case seven ribs were resected.

As I have already noted, if only the non-complicated cases, in which resection was performed early, were considered, the mortality-rate would be practically *nil*. But as I have made it a rule to perform the radical operation even under the most desperate circumstances, the mortality-rate is unfavorably influenced. Nevertheless, a series of cases recovered the chances of which were formerly regarded as quite hopeless.

Among them I may enumerate seven cases in which malodorous pus was present (so-called stinking empyema). Five of them were infants; in three of them grave gastro-enteritis was the precursor. In one case, a child of eighteen months, gastro-enteritis had been present two weeks before the signs of pyothorax developed. The considerable fever which was there in the beginning had nearly subsided, but there were always very rapid pulse and great weakness, a circumstance which points to the constant absorption of infectious elements. In one case, where diphtheria was the precursor, pyæmic foci were present. No antitoxin was given in this case.

In the other four fatal cases (one was a mixed infection) the presence of tuberculosis was proven by bacteriological examination. In three cases of well-developed tuberculosis the result was also fatal, in all of them the exitus occurring from three to eight weeks after resection.

In three cases of tuberculosis, where the diagnosis was corroborated by inoculation experiments, perfect recovery took place.

Statistics may easily mislead. If, as in some clinics, only the favorable cases are operated upon, the statistics will be accordingly favorable.

Schede reported seven deaths among eighty-six cases. In five of the latter grave septicæmia, pyæmia, and progressing gangrene of the lungs had been present. Of the other two one was due to sudden collapse after operation, and this accident could, according to Schede's own statement, have been avoided under different circumstances, dependent upon the surgeon. In the other case, a child of seven months, broncho-pneumonia was present on the other side when resection was performed. This properly

reduces the number of deaths to two or perhaps to one only,—in other words, to a mortality of not more than two and four-tenths per cent., or a percentage of ninety-seven and six-tenths of perfect and definite cures.

Glaeser ("Resectio costarum contra Heberdrainage bei Behandlung der Pleuraempyeme," Hamburg, 1890) reports twenty-one perfect cures in cases which were highly complicated. In all of them Glaeser had first tried Buelau's method unsuccessfully, performing resection only after the suction drainage had been kept up for seven weeks.

König, among seventy-six cases, lost ten after resection, the latter all being complications of the gravest character. (F. König, "Die Erfolge der Behandlung eitriger Ergüsse der Brusthöhle," *Berliner klinische Wochenschrift*, 1891, No. 10.)

Among forty-four cases of pyothorax J. Raczynski (Krakau) saw all those of metapneumonic origin recover after resection.

Among eleven cases of tuberculous pyothorax resected by Krönlein, four recovered perfectly, four died, and three were improved.

Perfect recovery took place in five of my cases of amyloid degeneration. These were old cases.

Some of the advocates of Buelau's method admit, however, the occurrence of many failures. Pel, for instance (P. K. Pel, "Bemerkungen über die Behandlung der Pleuraempyeme," *Zeitschrift für klinische Medicin*, 17, Bd. 199), and Quincke report many failures besides their successful cases.

Even Leyden (Leyden, "Ueber einen Fall von retroperitonealen Abscess nebst Bemerkungen zur Therapie der Pleuraempyeme," *Berliner klinische Wochenschrift*, 1889, No. 29) reports four cases of which only one was cured by Buelau's method, while another one was cured by resection performed later. The third case died from tuberculosis without being resected; and the fourth one died also, after having been resected at a very late stage.

Old Cases.—At the ninth congress of internal medicine, Ewald, seconded by Ziemssen, one of the greatest internists alive, made the potent declaration that "old cases of pyothorax should not exist, and when they do, the attending physician should be held responsible for their existence." While I heartily endorse this principle, still the fact that during the last three years I have had to perform very extensive operations in eleven cases of old pyothorax, shows that the golden age has not yet returned to us when the surgeons knew of such old cases only by hearsay. As long as the fable of the spontaneous healing of pyothorax still haunts reputable text-books on internal medicine, the realization of such an ideal state of affairs cannot be expected.

From a surgical point of view there is one pleasant feature about old cases of pyothorax,—namely, that while opinions on the surgical treatment of the acute form differ remarkably, there is unanimous agreement as to the principles of treatment in old cases. Hardly any surgeon, indeed, now expects good results from any other than the most radical operative steps.

As mentioned in the section on the history of pyothorax, Simon advised resecting several ribs to permit the collapse of the chest wall, in order to promote the healing process by approximating the costal and pulmonic surfaces of the pleuræ. But as the lungs do not approach the chest wall, the chest wall must be compelled to approach the lungs. If the ribs move closely together, thereby diminishing the size of the chest cavity, and if the shrinking of the costal pleura at the same time suffices to cause the movable neighboring organs to approach the chest wall, thereby filling up the cavity, the operation will be a success. But in most cases, particularly in older individuals, and if the cavity be very large, a fatal outcome cannot be prevented on account of the permanent suppuration.

In my last publication on this subject I deplored the poor results I had with this operation (the so-called Estlander's), only two cases recovering among five, and three succumbing; while in one of the successful cases I had to exsect pleural tissue later, so that even this one case is rather a credit to Schede's method. The reasons of the imperfect results are obvious. In the course of time the costal pleura becomes so much thickened that at last it forms a lining that is quite as strong and immovable as a bony one, and consequently is as great an obstacle to the approximation of the unexpanded lungs as are the ribs themselves. Such an immovable wall has, in consequence, to share the same fate,—namely, removal.

Since operating according to these principles my results are far better than formerly. Among eleven cases on which I have performed such extensive operations for old pyothorax, I lost only two.

As already stated, great credit is due to Max Schede for having first established these views in surgery. He proceeded, in fact, so radically sometimes, that he resected not only all the ribs of one side, but also the soft tissues in their totality, leaving only skin and scapula. It is evident that a mere skin-flap can easily be adapted to the pulmonic pleura.

The technique, as advised by Schede, is the following: On a level with the fourth rib and from the external margin of the pectoralis major muscle a bow-shaped incision is made downward to the tenth rib in the posterior axillary line, there being the lowest portion of the pleural cavity. Thence the incision is conducted upward again in a similar bow-shaped line to the median side of the scapula. Thus a large flap in the form of a horseshoe is secured. The incisions are made directly upon the ribs. After the scapula and the subscapular muscle are loosened from their under layer, all the ribs that cover the cavity are resected subperiosteally. Then, with a strong Cooper's scissors, the pleural swards and the interosseous tissues are also resected. The intercostal arteries are compressed by an assistant before being cut through. Then they are caught at once and enclosed by inserting a suture around them.

If the patient be exhausted, it is not necessary to complete the whole operation at once. It is advisable, then, to be contented with the resection of a few ribs and to postpone the resection of the balance until the patient

has improved. The cavity must be covered thoroughly with the skin-flap, and the wound edges united anteriorly, while the posterior area is left open to permit of the introduction of iodoform gauze.

The greatest difficulty arises always in the upper part of the cavity, thorough exposure of its area being very difficult. If necessary, the first rib must be resected,—a difficult procedure, which is best preceded by a temporary resection of the clavicle. Such extensive operations, however, are required only in adults.

Fig. 8.

Long incision for extensive resection.

In some of my old cases I have closely followed Schede's technique. I found it more advisable, however, not to invariably outline to any definite typical plan. I also gave up the horseshoe-shaped flap, and when necessary I did not hesitate to remove portions of the scapula. After selecting the rib which apparently forms the centre of the cavity ceiling, I make my incision-line alongside this rib, exactly in the same manner as described in the section on operative treatment, the only difference being that the incision is much longer. Then a long piece is removed, if the cavity be of great extent, in its whole length. Now the cavity is well exposed, and the further steps can be outlined. Usually the next lower and the next upper

ribs, together with the costal pleura, are resected in the manner described (see Illustration No. 8). In most old cases this suffices; but in cases of considerable extent I add vertical incisions, rectangular to the original one; generally one such incision, made either in the upper or the lower direction, according to the situation of the cavity, suffices in such cases; as a rule, one vertical incision is conducted up to the inner margin of the scapula. By dissecting the margin of the additional incision backward two triangular flaps are formed, which are to be retracted with strong tenacula. Thus the whole rib-roof can be exposed. Whenever possible, I try to save the muscular tissue and dissect away only the pleural swards.

If symptoms of collapse supervene during the operation, I stop, deferring further resection to a later period. Sometimes I have repeated the resections. I have gained the conviction that even the most extensive resection does not always guarantee a perfect recovery, and that on account of the irregular conditions of expansion, correcting operations have sometimes to be performed at a later period. *Vice versa*, a resection of small extent, removing just the thick central portion of the costal pleura and furnishing good drainage, is sufficient to heal up a cavity of large extent. It is, therefore, not advisable in the majority of cases to outline an extensive operation by forming an enormous horseshoe flap, but to choose a less extensive method from the beginning and to give this the necessary elongation later; the surgeon thus accommodating himself to the conditions as they turn up in the further course of the operation. If in exceptional cases the pulmonal pleura become so thickened as to obstruct the healing process, removal of its fibrous portions must also be performed. Anæsthesia is often difficult during the operation, and the rules laid down on incomplete anæsthesia in the section on operative treatment are to be strictly obeyed.

Some of the patients, after being cured, appear at first greatly mutilated. But it is surprising to see how they improve after the lungs become expanded, and with gymnastic exercise, particularly liberal motion of the arms, the depression as well as the scoliosis will disappear almost entirely. In my younger patients (compare Illustration No. 9) the spinal column is absolutely straight.

The ribs are nearly always restored, some of them, indeed, to a greater extent than is desirable. In one case (see Illustration No. 10, *b*) stalactite-like formations are noticeable; in others it can be seen that the ribs have lost their round, oval diameter and appear more like a broad wedge (see Illustration No. 10, *a*). Helferich explains such abnormal changes of the bone-tissue by absorptive processes induced by the irritation at the operation.

HISTORY OF CASES.

Case I.—M. L., thirty years of age; laborer; born in New York City. Family history good. In November, 1892, he took sick with influenza. Four weeks later the presence of pyothorax was diagnosed. Evacuation of the pus was done by Buelau's method. After the patient had carried around his pus-bottle in one of his

boots for fifteen months he was admitted to the St. Mark's Hospital, where, on March 17, 1894, I found the patient in a greatly exhausted condition. In the right anterior axillary line, in the sixth intercostal space, I noticed a thin rubber drain connected by a glass tube with a long rubber tube, which led into a bottle filled with bichloride. The drain was loose in the canal. The third, fourth, and fifth ribs, with the proportional area of the costal pleura were resected. In the bottom of the cavity a rubber drain nearly one foot in length was found, which had undoubtedly dropped into the cavity unnoticed. How long it had stayed there could not be ascertained, as we concealed the fact from the patient, and could not therefore get information from him in this regard. Recovery was perfect three months after the operation. The scoliosis which was present in the beginning disappeared.

Case II.—R. T., forty-nine years old; peddler; born in Hungary; twenty years in this country. Precursor, pleuro-pneumonia (right side). Incision four weeks after its onset; six months later resection, without benefit. On June 17, 1895, more than a year after the first operation I resected, at St. Mark's Hospital, the fourth, fifth, sixth, and seventh ribs, together with the proportional area of the costal pleura. Recovery was perfect four months thereafter.

Case III.—F. S., housewife, thirty-five years old; born in this city. Precursor, influenza. Three weeks after the onset of the disease aspiration, which was repeated eleven times during a period of two months; then resection of a small piece of a rib was performed. On July 19, 1894, two years after the first aspiration, I resected all the ribs from the third down to the eighth, including the latter. The costal pleura was also removed accordingly. Considerable shock (?). Slow but perfect recovery took place, the healing process requiring five months. Several times scraping of the cavity was done. No curvature.

Case IV.—J. L., seventeen years of age; office boy; born in New York City. Precursor, influenza. Simple incision (left side) five weeks after the onset of the disease. Nine months thereafter resection of a small piece of a rib. On December 19, 1894, when I saw the patient first, I found an enormous cavity, holding nearly one quart of fluid. I resected the ribs from the third one down to the eighth by making two parallel incisions alongside the fourth and the seventh ribs, from where the other ribs could be exposed. Recovery was perfect three months after the operation. No curvature.

Case V.—L. R., fifty-six years old, housewife; born in Germany; thirty-four years in Brooklyn. Family history good. Precursor, pneumonia (left side). Aspiration four weeks after the onset of the disease. Incision one week later. Ten months thereafter, on February 2, 1895, I resected the fourth, fifth, sixth, and seventh ribs, together with the corresponding area of the costal pleura. The cavity held one pint of fluid. Recovery was perfect three months after the operation. No curvature.

Case VI.—G. Z., housewife, thirty-eight years old; born in Germany; three years in New York City. Tubercular family history. Patient had pneumonia when a child. Has no children. Precursor, influenza. Incision five weeks after the onset of the disease. On August 27, 1894, fourteen months after the incision was made, I resected the fourth, fifth, and sixth ribs in their totality. The cavity held half a pint of fluid. Recovery was perfect two months after the operation. Very slight scoliosis.

Case VII.—C. L., male, eighteen months old at the time of the last operation; born in New York City. Precursor, pleuro-pneumonia (right side). Simple thoracotomy four weeks after the onset of the disease. When I saw the very much emaciated patient on May 24, 1896, for the first time, six months after the thoracotomy was performed, I hesitated to resect, as the case seemed to be entirely hopeless. Still, acting on the principle that the patient had nothing to lose, I resected the fourth, fifth, and sixth ribs, the patient getting only a few drops of chloroform during

the whole operation. Recovery was perfect two months after the resection. No curvature.

Case VIII.—Case presented to the German Medical Society of New York, October 5, 1896. H. B., tailor, twenty-one years old at the time of the last operation; born in Roumania; eleven years in this country. Was always well. Family history good. At the end of August, 1894, he was seized with pleuro-pneumonia. On September 9 thoracotomy was performed in a hospital of this city; whether a piece of rib was resected or not could not be ascertained. At the end of October, 1895, he was discharged from the hospital. Out-door treatment until beginning of March, 1895. A large cavity then existing, a prominent surgeon performed a so-called Estlander's operation, and, as far as could be ascertained, the seventh, eighth, ninth, and tenth ribs were resected. After having been treated in the hospital for another five months, the patient left uncured. On December 23, 1895, I performed resection of the third, fourth, and fifth ribs in their totality. At the same time I removed the stalactite-shaped formations from the stumps of the sixth and seventh ribs, which are shown in the lower portion of Fig. 10. In this case I made a horseshoe-shaped flap, as seen in Illustration 9. A Röntgen skiagraph, which was taken nine months after the last operation, shows granulating bone-tissue at the edges of the ribs last resected, and also shows that the lower ribs were entirely regenerated. The underlying costal pleura, the diameter of which was more than one inch at its thickest portion, was also removed. There was great difficulty in approaching the third rib, the scapula always being much in the way, although it was pulled rather forcibly over the thorax. The greater part of the enormous wound was sewed up, leaving only a posterior opening for the introduction of iodoform gauze. Uninterrupted recovery was perfect two months after the operation. The scoliosis which had been present disappeared entirely, the patient attending to his business and being normal in every respect.

Case IX.—Case presented to the German Medical Society of New York, October 5, 1896. Th. N., born in England; in this country since May, 1896; twenty-four years old; clerk. Family history good. On March 2, 1895, he developed influenza (severe pleuro-pneumonia, left side). Five weeks later resection for pyothorax was performed in Preston, England. Twenty-five weeks later another resection was made, this time a much longer piece being excised; considerable improvement followed this second interference, but once retention of pus occurred later. (I am indebted to the kindness of Dr. D. W. Brown, of Preston, England, for a report of this case.) On September 19, 1896, when I first saw the patient in consultation with Dr. Tillinghast, of Norwich, Connecticut, I found him in a desperate condition, the pulse being very frequent, the temperature high, and the retention of pus enormous. Nephritis and œdema of the lower extremities were also present. Operation at St. Mark's Hospital, September 21, 1896. On account of the miserable pulse, only little chloroform was administered. Exploration revealed that the roof of the cavity was represented nearly entirely by the scapula and the fourth, fifth, and sixth ribs. After having made a horizontal incision alongside the fifth rib, I could resect the fourth and sixth. The costal pleura was removed proportionally. The patient recovered with surprising rapidity, and was able to walk about one week after the operation. Two weeks after the operation the albumen had entirely disappeared, and after two weeks more the arm could be lifted vertically. Recovery was perfect ten weeks after the operation. The fourth and fifth ribs were closely attached to each other by an abundant proliferation of bone tissue, leaving only a small hole between them, as is shown in Fig. 10, upper portion. This was undoubtedly the point where the former resection was made. Around the small rubber tube a large amount of callus-like tissue had grown. From this fact it can be learned that even in a primary resection for pyothorax a piece of sufficient length must be sacrificed.

FIG. 9.

Horseshoe-shaped scar.

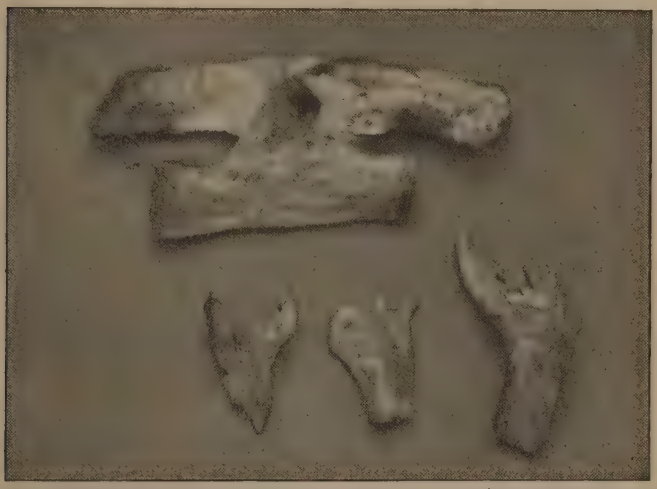
FIG. 11.

Skiagraph showing resection of ribs on the left.

The Röntgen skiagraph, taken one week after operation (Fig. 11), shows to what extent the ribs were resected.

Case X.—R. S., forty-four years old; bricklayer; born in Germany; ten years in New York City. Precursor, pneumonia (left side). Aspiration five weeks after

Fig. 10.



Upper portion, drain-hole in the centre; lower portion, stalactite-shaped formations on fragments previously resected.

the onset of the disease. During a period of two months aspiration was made eight times; then resection of a small piece of a rib was performed. More than one year later, on August 7, 1895, I resected the fourth, fifth, sixth, seventh, and eighth ribs in their totality. Death from exhaustion two weeks after.

Case XI.—Miss C. L., twenty-four years old; born in Germany; fifteen years in this country; tubercular family history. Had pneumonia three times when a child. Precursor, influenza. Aspiration six weeks after the onset of the disease. Two weeks later, resection (left side). On March 13, 1894, I resected the fourth, fifth, sixth, and seventh ribs, with the proportional area of the costal pleura. Death from exhaustion four weeks thereafter.

In conclusion, I desire to report a case, operated upon by Billroth, because of its somewhat romantic history. The patient, now a man of thirty-eight years, acquired pyothorax, preceded by pneumonia, in 1879 in Austria. An incision was made, but perfect recovery did not take place, although the patient remained in the hospital fully four and a half years, during which period he claims that he was chloroformed sixteen times and that two hundred operations (!) were performed on him altogether. The patient undoubtedly means curettings. After he was told that his case was incurable he tried to commit suicide by throwing himself into the Danube River, but he was saved by a policeman, who, sympathizing with the poor sufferer, was kind enough to send him to Billroth's clinic at Vienna in 1883, where he became perfectly cured. The very large and deep scar (Il-

lustration No. 12) indicates that Billroth had resected the second, third, fourth, fifth, and sixth ribs from the sternum to the right median axillary line. The skiagraph (Fig. 13) shows very well the replacement of the resected ribs by new osseous tissue.

REVIEW OF MEDICINE.

MEDICINE.

IN CHARGE OF JOHN H. MUSSER, M.D.,
Assistant Professor of Clinical Medicine in the University of Pennsylvania; Visiting Physician to the Presbyterian and Philadelphia Hospitals,

J. A. SCOTT, A.M., M.D., AND JOSEPH SAILER, M.D.,
Physician to the Out-Patient Department of the Pennsylvania Hospital, Associate in the Pepper Clinical Laboratory.

Investigations on the Application of the Phonendoscope of Bianchi. (*Münchener medicinische Wochenschrift*, November 10, 1896.) By B. F. Egger, M.D.

After first stating a personal objection that sounds caused by rubbing parts of the instrument are conveyed to the ear with painful intensity, Egger reports an elaborate series of experiments that were suggested by the absence of metallic sound in certain intrathoracic sounds as heard through the phonendoscope. By these he determined that the instrument was incapable of transmitting sounds of greater vibratory rapidity than six thousand per minute, or even less. Tones of lower intensity were magnified. As a result, certain high-pitched heart-murmurs are absolutely inaudible, and amphoric breathing is imperfectly heard or converted into ordinary bronchial breathing. In conclusion, he calls attention to the fact that the attempt to outline the organs by rubbing is inaccurate, inasmuch as the change of note occurs at a certain distance from the staff without particular relation to the border of the organ, as can be proven by experiments on the thigh.

The Dietetic Value of Fat in Diabetes. (*Edinburgh Medical Journal*, November 18, 1896.) By James C. Dunlop, M.D.

The patient, a man of fifty, with a daily excretion of from one hundred to two hundred and fifty grammes of sugar, was subjected to a rigid diet of skimmed milk containing 24.8 grammes N *per diem*. For two periods of three days this was given alone, and for two alternating periods of three days one hundred and seventy cubic centimetres of olive oil were added. The urine was tested for total N by Kjeldahl's methods, for preformed

Fig. 12.

Billroth's case.

Fig. 13.

Skiagraph of Billroth's case showing replacement of ribs by new osseous tissue.

NH_3 by Schlössinger's method, and for glucose by the polarimeter. The fæces were tested for total N, and on the sixth and twelfth days for oil. The averages were as follows: First and third periods (without oil), urine, quantity, 4891 cubic centimetres; total N, 21.8 grammes; preformed NH_3, 0.62; glucose, 174 grammes. Second and fourth periods (with oil), quantity, 5045 cubic centimetres; N, 23.4 grammes; NH_3, 48 grammes; glucose, 179 grammes. Fæces, respectively, N 0.38 and 0.44; oil, sixth day, 3.53; twelfth day, 8.01. The N balance was nearly perfect; the oil slightly increased the quantity of urine and of total N, and was itself almost entirely absorbed. The amount of glucose was not materially affected. The oil, however, was not converted into sugar, and must therefore either have been stored up for future use or else converted into energy, and in these ways it may be of considerable use.

In the Verein für innere Medicin, Litten (*Berliner klinische Wochenschrift*, November 5, 1896) presented a case of cyanosis in which all the ordinary signs of congenital malformation of the heart were absent. He concluded, therefore, that there must be a transposition of the pulmonary artery and the aorta, and that sufficient oxygen to maintain life was absorbed by the blood in the bronchial vessels. Twenty-four cases of this condition have already been recorded. A. Fränkel disputed the assumption that physical signs are invariably present in case of congenital anomalies of the heart.

In the same meeting Bernhardt reported the case of a child of five years suffering with whooping-cough, that on the tenth day suddenly became paralyzed in both legs, and had some difficulty in evacuating the bladder. The knee-jerks were increased, the electrical reaction and nutrition of the muscles normal, and the sensation slightly diminished. At the end of four weeks some improvement was noticeable, that, with some remissions, continued until almost perfect recovery ensued. During the convalescence the condition on one occasion was rendered much worse by an attack of mumps. Regarding the causation of the symptoms, he suggested the possibility of hemorrhage into the cord, or some septic process or intoxication. In the discussion Heubner stated that such conditions can occur in whooping-cough without the occurrence of gross lesions, and Baginsky suggested that all the symptoms might be due to hysteria.

NEUROLOGY.

IN CHARGE OF LANDON CARTER GRAY, M.D., New York City,
GUY HINSDALE, M.D. Philadelphia,
WILLIAM BROADDUS PRITCHARD, M.D., New York City, AND
WM. G. SPILLER, M.D., Philadelphia.

Primary Muscular Dystrophy in Two Brothers. (*Medical Record*, November 7, 1896.) By Theodore Diller, M.D.

The hereditary feature of the muscular dystrophies strongly points to their being due to developmental defects; and this heredity, as has been pointed out, is one of the chief clinical characteristics of the muscular dystrophies. In these cases the parents are healthy. In both cases there was slow onset in childhood; atrophy affecting the shoulder girdle, upper arms, and thigh. In neither case was the face involved, and there were no fibrillar twitchings. In one of the cases there were marked contractures of the thighs and legs. This conformed to Erb's type. In the second case there was considerable hypertrophy of the calves, suggesting pseudo-muscular hypertrophy; lordosis, and waddling gait. There was marked atrophy of the upper arms and shoulder-girdle with apparent moderate hypertrophy of the deltoids and slight atrophy of the thighs. The latter case was therefore of mixed type.

Myelitis; a Case in which the Symptoms appeared several Weeks after the supposed Cause. (*Boston Medical and Surgical Journal*, November 5, 1896.) By S. G. Webber, M.D.

A man, aged sixty-eight, fell at a crossing and severely jarred the whole body. Twelve weeks later symptoms of myelitis set in, from which the patient steadily grew worse and finally died. There was no autopsy, but the author supposes that, although insignificant at its origin, the lesion was quite possibly due to a hemorrhage of the cord.

Concerning Pseudo-Spastic Paresis with Tremor following Trauma. (*Neurologisches Centralblatt*, Nos. 20 and 21, 1896.) By Dr. Nonne.

Fürstner has described two cases in 1896 with a symptom-complex which he has called "pseudo-spastic paresis with tremor." In his cases spasm and tremor of the muscles with some weakness, especially in the lower limbs, were noticed after trauma. The muscular tonus was modified by the mental state of the patient. The intensity of the tremor also varied. Fürstner believed the disease to be a functional neurosis. Nonne had previously, in 1896, published briefly several cases with this symptom-complex. In his present paper he gives the history of seven cases. With Fürstner's two cases there are now nine cases with this symptom-complex reported.

The cause of the disease is trauma, which usually chiefly affects the back. Frequently the patient complains at first of obstinate pains in the back and breast, which may persist as long as the disease lasts. None of Nonne's patients were hereditarily afflicted, none were syphilitic, none had taken much alcohol. The disease, according to Nonne, begins usually as follows:

Either at once or else some time after an accident a subjective weakness with tremor develops in the lower limbs after moderate exertion. The tremor involves all parts of the limbs and in certain cases the entire body. It may be so intense that standing becomes impossible. The muscles of the affected limbs tend to contract, and these contractures may be so severe as to cause pain. In mild cases during rest the muscles are relaxed and without tremor. They are not so, however, in severe cases. Observation and intentional movements increase the spasms and tremor. Real paresis does not exist, but there is a disproportion between the amount of muscular force and the development of the muscles. The gait is not characteristic of any known disease. Disturbances of sensation may be present or absent. Various symptoms of the neuroses may be observed. The pupils react normally.

The tendon reflexes in all of Nonne's cases were lively, but typical patella or foot clonus was not found, neither were the sphincters involved. There was no mental disturbance. The disease is essentially functional. Prognosis is bad. Only one of Nonne's cases recovered.

The Effects of Early Optic Atrophy upon the Course of Locomotor Ataxia. (*Medical Record*, November 14, 1896.) By Pearce Bailey, M.D.

It has been known that optic atrophy has a very decided influence on the development of tabes. Dr. Bailey states from his observation that—

1. In about seventy-five per cent. of the cases of tabes, in which optic atrophy is an early symptom, some of the other tabetic symptoms may be late in appearing or may not develop at all. This is especially the case in respect to the lightning pains and the incoördination of movement. The loss of knee-jerk in such cases is very constant.

2. The most distressing symptoms may develop simultaneously with or immediately succeed the blindness.

3. The association with the optic atrophy of oculomotor palsies is without prognostic significance.

The Cerebral Complications of Raynaud's Disease. (*American Journal of the Medical Sciences*, 1896.) By William Osler, M.D.

Dr. Osler writes on the complications of the central nervous system in Raynaud's disease. Perhaps the most frequently associated disorder is hysteria. Occasionally there are symptoms pointing to serious disturbances in the functions of the brain. Three cases are reported.

In Case I. the patient had hæmoglobinuria and attacks of epilepsy when the local symptoms of Raynaud's disease were present. The attacks occurred only in the winter.

In Case II. there were recurring attacks of aphasia with transient hemiplegia and dizziness. In the patient's final illness the right hand and fingers were completely gangrenous.

In Case III. painful swelling of the legs between the knees and ankles was noticed. The patient had attacks of falling without aura or convulsions, and probably without loss of consciousness. These may have been hysterical.

Facial Paralysis. (*Neurologisches Centralblatt*, November 21, 1896.) By Toby Cohn, M.D.

Cohn describes a case of facial paralysis with deafness, which began acutely. The paralysis of the left side of the face occurred in a child of three years, and was accompanied by fever and convulsions. The cause was supposed by the attending physician to be inflammation of the brain. The convulsions were not repeated, but the facial paralysis persisted. Cohn thinks the cause may have been hemorrhage within the internal auditory meatus or else meningitis. He claims that this is the first case ever reported of unilateral facial paralysis with deafness occurring acutely and not resulting from trauma. The fact that certain of the facial muscles were not paralyzed in a lesion of the trunk of the seventh nerve is explained by the supposition that some of the fibres within the nerve escaped injury. Indeed, in lesions of the trunk of the seventh nerve the orbicularis oculi and orbicularis oris, more perhaps than other facial muscles, may remain intact, and it is not necessary to ascribe the cause to nuclear disease.

A Contribution to the Pathology of Epilepsy. A Report of Two Cases in which a Portion of the Brain Cortex was Excised and Examined. (*Brain*, 1896.) By Joseph Collins, M.D. Microscopical examination of the first case by A. Wiener, M.D.

The first patient reported had only had three epileptiform attacks before the operation was performed. These began in the fingers of the right hand and were associated once with loss of consciousness and biting of the tongue. There was no history of recent injury to the head of any import, although four or five years previously the patient had been thrown against a wall. The diagnosis of Jacksonian epilepsy was made, and, as there was absence of optic neuritis, headache, vomiting, etc., the cause was supposed to be meningo-encephalitis and not brain tumor. At the operation the dura appeared normal. A portion of the central convolutions, which previously on being irritated with the faradic current had given rise to contractions in the hand, was excised. Two pieces of cortical tissue each about the size of the terminal phalanx of the thumb were removed.

Within a week the paralytic symptoms produced by the operation had

become comparatively slight, but paralysis of sensation seemed to develop in the right index finger and thumb and considerable ataxia in the movements of the hand was noticed.

Somewhat more than a year after the operation, and very nearly a year after the last epileptic attack, the dynamometer in the right hand registered 30, in the left, 100. Myotatic irritability of the right upper extremity was increased. Muscular sense was somewhat diminished in the right hand and the sense of position was not perfect. The hand had a tendency to remain in a semiflexed position. There had been no mental deterioration and nothing that resembled an epileptic attack. Bromide of potassium had been given.

The cortical tissue was submitted to microscopical examination. The pia was found to be thickened and adherent and in some places had grown into the cortex. The neuroglia was increased in certain areas. The blood-vessels were distended and their walls were thickened and infiltrated with cells. Some of the vessels were occluded. Cellular infiltration and softening were also found within the cortex. Many of the ganglion-cells were altered.

In pieces of cortex removed from another case of epilepsy of the idiopathic focal type numerous hemorrhages, probably resulting from the operation, and altered large pyramidal cells were found.

The Surgical Treatment of Focal Epilepsy. (*American Journal of the Medical Sciences*, October, 1896.) By B. Sachs, M.D., and A. G. Gerster, M.D.

The authors report the results of their observations of nineteen cases of partial epilepsy. They include not only the cases of traumatic origin, but also those in which localized convulsions were associated with other diseases, especially with early infantile cerebral palsies. In only a single case could death be attributed directly to the operation. We are informed that the return of the attacks during the first few days following an operation by no means proves that the surgical procedure has been a failure. The paralysis produced by the excision of a diseased portion of the motor area was found to be merely transitory, probably because this area had ceded its functions to neighboring, healthy portions of the cortex.

They draw the following conclusions:

1. Surgical interference is advisable in those cases of partial epilepsy in which not more than one or, at the utmost, two years have elapsed since the traumatic injury or the beginning of the disease which has given rise to the convulsive seizures.

2. In cases of depression or other injury of the skull surgical interference is warranted even though a number of years have elapsed; but the prospect of recovery is brighter the shorter the period of time since the injury.

3. Simple trephining may prove sufficient in a number of cases, and

particularly in those in which there is an injury to the skull or in which a cystic condition is the main cause of the epilepsy.

4. Excision of cortical tissue is advisable if the epilepsy has lasted but a short time, and if the symptoms point to a strictly circumscribed focus of disease.

5. Since such cortical lesions are often of a microscopical character, excision should be practised even if the tissue appears to be perfectly normal at the time of operation; but the greatest caution should be exercised in order to make sure that the proper area is removed.

6. Surgical interference for the cure of epilepsy associated with infantile cerebral palsies may be attempted, particularly if too long an interval has not elapsed since the beginning of the palsy.

7. In cases of epilepsy of long standing, in which there is in all probability a widespread degeneration of the association-fibres, every surgical procedure is useless.

OPHTHALMOLOGY.

IN CHARGE OF CHARLES A. OLIVER, A.M., M.D.,
Philadelphia, Pennsylvania,
AND
EDMUND LANDOLT, M.D.,
Paris, France.

The Prognosis of Ocular Tuberculosis. (*La Clinique ophtalmologique*, May, 1896.)—de Wecker, of Paris, has had the good fortune to remove so completely an area of tuberculous material from an iris in a five-year-old boy that seven years later the vision of the previously affected eye was normal and the patient's general health was good. He is opposed to enucleation in such cases because, in accordance with Leber's belief, he thinks that ocular tuberculosis is merely a very slight form of the dyscrasia and that it is readily removed. He believes that no one has authority to consider tuberculosis of the eye as primary, and that, in consequence, the supposed protective effect of enucleation is unscientific and hypothetical. Further, he says that removal of the eye in young subjects is a grave mutilation tending to produce marked facial asymmetry.

FORENSIC MEDICINE.

IN CHARGE OF LORENZO D. BULETTE,
Of the Philadelphia Bar.

A CASE OF CONTRIBUTORY NEGLIGENCE DEFEATING AN ACTION FOR ALLEGED MALPRACTICE.

(Concluded from page 788.)

"Against all this formidable array of testimony," says the Supreme Court, "there was not a single fact or opinion given in evidence. It was entirely uncontradicted. It was manifestly impossible to set up a dividing line at the time the plaintiff left the hospital and attempt to separate these consequences of alleged treatment of the defendant, which occurred prior to the plaintiff's leaving the hospital, from the ulterior consequences resulting from the plaintiff's contributory negligence after he left. It is impossible to set up a standard, because it is impossible to know what would have been the result of the defendant's treatment if the plaintiff had remained at the hospital."

The nurse did not distinctly say that she repeated to the plaintiff the defendant's answer,—namely, that if he left the hospital he did so on his own responsibility. She was not asked the distinct question whether she did or not. She did say that Dr. D. said these words to her, but omitted to say whether she repeated them to the plaintiff. "We think," says the Supreme Court, "the plaintiff must be held responsible for the consequences of omitting to have medical treatment after he left the hospital, and for his travel to W. and B. He did not advise with the defendant as to those matters, and he cannot hold the defendant responsible for his own voluntary acts in relation thereto."

And, continuing, the Supreme Court says,—

"After a painstaking, careful, and minute study of the testimony in this case we are constrained to say that we regard the verdict of the jury as an outrage upon the administration of justice. There was no aspect of the testimony upon which it could be justified for any such amount, in any event. The plaintiff's case, at the very best, was of the most doubtful character. No verdict could be sustained at all except by striking down the testimony of ten entirely competent, disinterested witnesses, and accepting in its place the testimony of two witnesses who, whatever may be their personal merits, did not possess a tithe of the experience or means of ob-

servation enjoyed by the defendant's witnesses. As to three of these men who personally saw and carefully and frequently examined the plaintiff's leg immediately after the accident, when it could be best observed and considered, their testimony was absolute and positive that there was no fracture. They were all disinterested, entirely capable, and, two of them at least, having very large experience in this class of cases, and there is no reason discoverable in the testimony why their judgment and their evidence should be rejected in order to give place to the opposing testimony of two of the plaintiff's witnesses, one of whom did not see the patient until eighteen days after the accident, and the other not until forty-eight days had elapsed. In the mean time the plaintiff's conduct and action were such that even a fracture might have supervened on that account, but the most experienced and competent of the defendant's witnesses were of opinion, and so testified, that every condition of the leg as seen by Dr. E. at B. could easily be accounted for by the conduct of the plaintiff after he left the hospital.

"On the subject of the plaintiff's contributory negligence in this regard there was no disputed testimony. It was established by all the evidence in the case, including that of the plaintiff's witness, Dr. E. No opinion of any witness was given to the contrary, and it was therefore an undisputed fact in the case. The learned court below very properly charged the jury that if the plaintiff's conduct was such, after leaving the hospital, as to contribute to his condition, he could not recover for such consequences as happened after he left the hospital. But the evidence being entirely undisputed on that subject, it must be regarded as establishing the fact of contributory negligence on the part of the plaintiff, and hence the case should have been withdrawn from the jury, in accordance with the defendant's contention that under the evidence the verdict should be for the defendant. The learned court below showed its appreciation of the verdict by promptly striking down two-thirds of its amount, and might with still greater propriety have set the verdict aside altogether because of its being against the law and the evidence and grossly excessive in amount."

As to the policy of encouraging suits of this character against such defendants, the Supreme Court goes on to say, "It must not be overlooked that the medical and surgical service rendered by the defendant to the plaintiff was entirely gratuitous, the defendant receiving no compensation of any kind. For many years Dr. D. had been rendering such service to the hospital to which the plaintiff was brought after receiving his injury. He was one of a corps of physicians who, from motives of benevolence and charity, contribute, as they do in many other cities and towns, their time, their skill, their labor, and their most valuable and humane service in relief of the sickness and suffering of their race. If such gentlemen are to be harassed with actions for damages when they do not happen to cure a patient and are to incur the hazard of having their estates swept away from them by the verdicts of irresponsible juries who, caring nothing for law, nothing for evidence, nothing for justice, nothing for the plain teachings of

common-sense, choose to gratify their prejudices or their passions by plundering their fellow-citizens in the forms of law, it may well be doubted whether our hospitals and other charitable institutions will be able to obtain the gratuitous and valuable service of these charitable and unselfish men. It is much more than probable that if this plaintiff had been content to remain at the hospital a week or two longer he would have been cured of his hurt. Because he would not submit to such a reasonable detention he apparently brought upon himself all his subsequent sufferings. If he chooses to take such risks he must take the consequences himself.

"The plain truth is that this plaintiff was probably afflicted with a tendency to tuberculosis, and when he received his injury that tendency became developed in the bones of his leg and the disease called tuberculosis of the bone fastened upon him at the seat of the injury. Dr. L. held to this theory and treated him for it with success. When this witness testified for the plaintiff he was asked, '*Q.* Were there any broken bones in the limb? Had there been a fracture? *A.* No evidence of it at the time of my examination.' Continuing, he said, 'No particular bone was injured so far as was evidenced at the time of my examination. At that time I discovered a tuberculous inflammation involving the totality of the ankle-joint, extending into the substance of the lower end of the tibia and astragalus, disintegrating these and causing small pieces of bone to drop off from them with the rest of the products of inflammation.' On the second trial he testified, 'What we mean by tuberculous arthritis is this: there is such a disease as tuberculosis that is very widely disseminated in nature. Sometimes it develops in people's lungs and then it is called consumption, and when it develops in a man's ankle it is called a tuberculous arthritis. Now, in this patient's case he had all the predisposition that a patient has to develop consumption, but inasmuch as he injured his ankle, that spot—that is, the ankle—became the weakest spot in his body, and, having the predisposition to develop tuberculosis, he developed tuberculosis of the ankle-joint.' . . . 'What I had there was tuberculous disease. There was no evidence of the fracture, there was no play of the bones at all. Everything was united and solid, and I didn't care whether he had had a fracture or not. That didn't enter into the case. He had tuberculosis of the joint. He came there to be treated for tuberculosis of the joint, and that I did for him.' The foregoing theory," adds the Supreme Court, "is the only one that will satisfy all the facts in evidence." And the judgment against the defendant surgeon was accordingly reversed.

BOOK REVIEWS.

MINOR SURGERY AND BANDAGING. By Henry R. Wharton, M.D., Demonstrator of Surgery in the University of Pennsylvania, Surgeon to the Presbyterian, Methodist Episcopal, and Children's Hospitals. Third edition, thoroughly revised and enlarged, with 475 illustrations. Philadelphia and New York: Lea Brothers & Co., 1896.

The fact that this book has reached its third edition inside of five years is evidence enough both of its popularity and worth.

The present edition has been revised and enlarged by the addition of new material upon the subjects of excisions of the joints, operations upon the nerves, tendons, etc. Although not intended as an elaborate treatise on operative surgery, it will nevertheless be found to be an almost complete guide to the operations usually taught to students. It is a very complete exposition on the subject of which it treats, embracing the whole domain of minor surgery and a considerable portion of that of major surgery. It is pre-eminently fitted by its conciseness and excellence of arrangement to be used as a text-book for students. G. G. D.

LE GONOCOQUE. Par Dr. Marcel Sée, Ancien Interne des Hôpitaux de Paris. 8vo, pp. 355. Paris: Ancienne Librairie germer Baillière et Cie., Félix Alcan, Éditeur. 1896.

This volume of three hundred and fifty-five pages is devoted to a *résumé* of the literature relating to the gonococcus, to the record of fifty experiments with the organism, and to the record of thirty-six complicated and uncomplicated cases of gonococcus-infection.

The work consists of two parts and an appendix. In the first part of the book we have an experimental study of the gonococcus, which, in four chapters, treats of its microscopic examination, of its culture, of its biology out of the organism, and of its inoculation into man and animals.

In the second part of the volume we meet with an exhaustive clinical study of the disease produced by the micro-organism under discussion. Original experiments and record of personally observed cases find place in the appendix.

The work is valuable for its matter and for the bibliography which it contains. The general conclusions, given on page 208, are valuable, and will bear being emphasized.

First: Blennorrhagia is a specific, infectious disease, arising only from itself and by the inoculation of blennorrhagic products. Its manifestations are multiple, as are the manifestations of the majority of infections, and urethritis is only the most frequent.

Non-blennorrhagic urethritis exists distinct, even clinically, from urethral blennorrhagia.

Second: The gonococcus of Neisser is the cause of blennorrhagia. This is a pathogenic micro-organism, and is as definitely characterized by its morphologic and biologic properties as by its action upon the human organism.

The gonococcus is clearly distinct from the saprophytes of the genito-urinary

apparatus, and is diagnostic. It is never found as the normal inhabitant of any organ.

Third: If it is true that certain blennorrhagic manifestations are of a toxic nature, and if, on the other hand, secondary affections are frequent in blennorrhagia, it is not less certain that the majority of blennorrhagic manifestations are, or at least may be, caused directly by the presence of the gonococcus at the diseased points.

The gonococcus may be carried especially by the blood-paths in order to give rise to diseased foci, such as arthritis and endocarditis, at a distance from its point of entrance into the economy. J. M. S.

New Methods in the Science of Fitting Glasses. By W. G. Fay, Optician. Small 8vo, pp. 115. Springfield, Ohio: The Hosterman Publishing Co., 1896.

This little book is of interest to the physician, as in it the author states that the old method of prescribing glasses simply to improve the vision is insufficient, endeavors to show that the new and proper way is always to relieve the eye-strain and consequent exhaustion of the nerve energies, whether vision is improved at first or not.

He formulates various rules of procedure, giving preference to an optomyometer of his own construction for the recognition of the total amount of error, and he makes slightly varying plans for the selection of lenses that are to be used in the patient's spectacle-frames.

The reviewer has been well pleased with the manner in which some of the subject-matter has been put, and would recommend the book for both study and criticism. C. A. O.

Röntgen Rays and Phenomena of the Anode and Cathode. By Edward P. Thompson, M.E., E.E. New York: D. Van Nostrand Co.

In this little volume of nearly two hundred pages, and containing over one hundred illustrations, the author has traced with the greatest care the various steps in the history of the development of the electric discharge from the time of Faraday to the present.

The period may conveniently be divided into three epochs with reference to the degree of exhaustion in the tubes or vessels through which the discharge takes place. In the experiments of Faraday, Plücker, and Geissler the internal pressure was only about one one-thousandth of an atmosphere; while in the experiments of Hittorf (1869) and of Crookes (1879) an internal pressure of only one one-millionth of an atmosphere was obtained.

The various investigations of these men, together with those of many others, including Spottiswoode, Moulton, De La Rue, Hugo Müller, Goldstein, Wiedemann, Elster and Geitle, J. J. Thomson, Hertz, Lenard, and finally of Röntgen, are treated with great fidelity.

In nearly every case reference is made to the literature from which the information was obtained, this proving of great value to a student who wishes to look up more in detail any special part of the subject.

The first six chapters are concerned with the history up to the time of Röntgen's discovery of the X-rays proper.

The latter half of the book deals mostly with the results of experiments, both in this country and in Europe, from a practical as well as from a theoretical point of view. Moreover, it seems to be the conviction of the author that in the character of the work done and in the results obtained our own country has not been surpassed by any of those of Europe.

In the final chapter, on "Theoretical Considerations," Professor Anthony briefly

sums up our present knowledge of the subject, carefully avoiding to commit himself to any one of the several theories discussed.

This book should prove of the greatest value to any one wishing to obtain a hasty view of the subject. A. W. G.

Ophthalmic Operations as Practised on Animals' Eyes. By Clarence A. Veasey, A.M., M.D., Adjunct Professor of Diseases of the Eye, Philadelphia Polyclinic, Chief Clinical Assistant to the Ophthalmological Department, Jefferson Medical College Hospital, etc. Small 8vo, pp. 99. Philadelphia: The Edwards & Docker Co., 1896.

This little book, the first of its kind, has been prepared by one who has had a most carefully trained experience in such work. The methods of technique have been more or less limited to the most common operations in and around the eyeball.

Commencing with the choice of eyes, the time of removal from the animal, and the best methods of preservation for operation purposes, it next deals with the various forms of phantom-masks, etc.

From these general considerations, the operations are described *ad seriatim* in a way that can be well understood by beginners in ophthalmology for whom the book has been written.

The reviewer, having found it useful among his own students, cordially recommends it to those who desire such information and knowledge. C. A. O.

Skiascopy and its Practical Application to the Study of Refraction. By Edward Jackson, A.M., M.D., Professor of Diseases of the Eye in the Philadelphia Polyclinic and College for Graduates in Medicine; Surgeon to Wills Eye Hospital, etc. Second Edition. With twenty-seven illustrations. 8vo, pp. 108. Philadelphia: The Edwards & Docker Co., 1896.

It is very gratifying to the reviewer that this excellent manual, based upon the careful and conscientious experience of one who is master in this art, should so soon be brought to a second edition.

The work is one that must live and ever be the guide of the practical ophthalmologist. Expressed in terms that are terse and easily understood; written in a style that can be readily comprehended by the beginning student; and containing much that is new and original for the guidance of the advanced and working practitioner; it, in each case, subserves a purpose that is indispensable. That it should be upon the work-table of all who are interested in, teach, or deal with the subject in any way there can be no doubt; that it is the best exponent of the method that we now possess is certain. C. A. O.

The Ready-Reference Hand-Book of Diseases of the Skin. By George Thomas Jackson, M.D. With sixty-nine illustrations. Second Edition, revised and enlarged, pp. 594. Philadelphia: Lea Brothers & Co., 1896.

This revised edition is a satisfactory successor to the first. The same character of alphabetical arrangement of diseases, terseness of text, clearness of expression, and a full proportion to the subject of treatment, give distinct individuality and value to the book. Nineteen new illustrations have been added, and the text has been considerably increased. To make the volume more comprehensive a brief presentation of the rarer and new diseases has been added,—such as acromegaly, actinomycosis, angioma serpiginosum, clavus syphiliticus, dermatitis repens, multiple benign cystic epithelioma, erythema induratum, feigned eruptions, etc. Dr. Jackson is a good observer, a clear writer, and trustworthy in his therapeutical directions. These qualities are reflected in the book, and make it therefore a valuable hand-book for the student and the busy practitioner; and to this large class we commend it cordially. H. W. S.

AN AMERICAN TEXT-BOOK OF APPLIED THERAPEUTICS. For the Use of Practitioners and Students. Edited by J. C. Wilson, M.D., Professor of the Practice of Medicine and of Clinical Medicine in the Jefferson Medical College, etc., etc. Assisted by Augustus A. Eshner, Professor of Clinical Medicine in the Philadelphia Polyclinic, etc. Price: Cloth, $7.00; sheep or half morocco, $8.00; half Russia, $9.00. Philadelphia: W. B. Saunders, 1896.

This is the latest addition to the series of "American text-books," and although it deals chiefly with the medical side of therapautics it makes a large volume of 1326 pages. The subjects are allotted to the various authors as follows: Dr. I. E. Atkinson, of Baltimore, treats of acute poisonings, influenza, and the resuscitation of persons apparently drowned; Dr. Victor C. Vaughan, of Ann Arbor, of the food infections; Dr. Eshner, of milk-sickness, miliary fever, sweating-disease, Weil's disease, and infective jaundice; Dr. Frese treats of drug-habits; Dr. Robert T. Edes, of chronic intoxications; Dr. John Chalmers DaCosta, of septicæmia and pyæmia, erysipelas, anthrax, hydrophobia, tetanus, glanders, and actinomycosis. Diphtheria is admirably treated by Dr. W. P. Northrup, of New York. This article is full of instructive illustrations, which, by the way, are liberally scattered through the work and make this series of text-books especially valuable. Dr. Louis Starr treats of whooping-cough, and Dr. J. W. McLaughlin of dengue.

The most intersting article in the book is that by the editor. Dr. Wilson devotes fifty pages to the treatment of typhoid fever, in which he fully unfolds the Brand system, in the use of which he has had such marked success. That this method of treatment is based upon principles which are as yet not fully understood is seen from the fact that the author states that the theories of its action are not entirely satisfactory; for, although the bath is powerfully antipyretic, its influence in this respect must be regarded, in part at least, as secondary. Its chief action is exerted on the nervous system, which it affects in such a manner as to increase its resistance to the toxic principles of the disease. This, the author says, is doubtless accomplished by the action of the cold water on the peripheral nerve-endings, a stimulus being transmitted to the nerve centres presiding over the functions of the circulation, respiration, digestion, nutrition, and excretion.

The editor also takes up the treatment of typhus and relapsing fever, cerebro-spinal meningitis, and the plague. Yellow fever is treated by Professor John Guitèras, who speaks from his unusual experiences at Havana, and more lately at Jacksonville and Brunswick, where he rendered such energetic assistance to the United States government in stamping out the disease. Cholera is also treated by one of the government's experts, Dr. E. O. Shakespeare. The chapter on leprosy is by the late Dr. Beaven Rake, of Trinidad. Croupous pneumonia is treated by Dr. Danforth, of Chicago; tuberculosis, by Dr. James T. Whittaker, of Cincinnati. This article is in seventy pages and is thorough and eminently practical. It shows wide reading and as wide an experience. Syphilis is treated by Dr. Orville Horwitz; dysentery, by Dr. W. W. Johnston; and malaria, by the famous Dr. A. Laveran.

Malarial fever is treated by Dr. John L. Dawson, Jr., of South Carolina, and the exanthemata by Dr. George Dock, of Ann Arbor. The animal parasites and diseases dependent on external heat are treated by Dr. F. A. Packard, of Philadelphia; rheumatism, gout, rheumatic arthritis, and scurvy, by Professor Stewart, of Montreal; obesity, by Dr. Henry, of Philadelphia; diseases of the stomach, by Dr. Charles G. Stockton; the intestines, by Dr. W. W. Johnston; the liver, by Dr. Dabney; the diseases of infants, by Dr. E. E. Graham; diseases of the heart, by Dr. Forchheimer; and diseases of the blood by Dr. Osler. Nervous and mental diseases are treated at the hands of Drs. Eskridge, Dercum, Lloyd, Sinkler, Hinsdale, Mills, and Chapin.

The careful editing, the excellent arrangement, and the perfect execution make this book a standard work of reference that will not fail to give great satisfaction to practitioners.

ITEMS OF INTEREST.

The Last of Quarantine in the United Kingdom.[1]

The Public Health Act of 1896 came into operation on November 9, finally abolishing the last remnant of quarantine which was maintained against yellow fever and plague in order to secure the commerce of Great Britain against unnecessary restrictions in foreign ports. This change transfers the control of yellow fever and plague in ports from the Privy Council to the Local Government Boards of the three divisions of the kingdom. The Local Government Board has issued an order embodying their regulations regarding yellow fever, plague, and cholera, the preventive measures concerning the two former diseases being practically the same as those which have been so successful in the prevention of cholera. No difficulty is anticipated with foreign nations from the change. In the opinion of the *Lancet*, most nations have come to realize that British methods of dealing with cholera in its own ports are really as effectual as theirs. It is noted that unless ships supposed to be infected with yellow fever or plague happened to select the Solent for purposes of arrival the usual port authorities would deal with the matter, having done so, in fact, as regards yellow fever. The *Lancet* also wishes that the same abandonment of antiquated forms would be observed regarding the crown colonies of the Mediterranean, for which the advisers to the crown are responsible. It is hoped that soon local legislators of these colonies will learn that the best measures for prevention of disease are found in sanitary improvements, and that too implicit trust in quarantine restrictions avoids the strongest incentive to expenditure in measures for the promotion of public health.

NOTE TO CONTRIBUTORS.

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Manuscripts, exchanges, and books for review should be addressed to the Editorial Office, 3709 Spruce Street, Philadelphia.

[1] Lancet, November 14, 1896.

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TO

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